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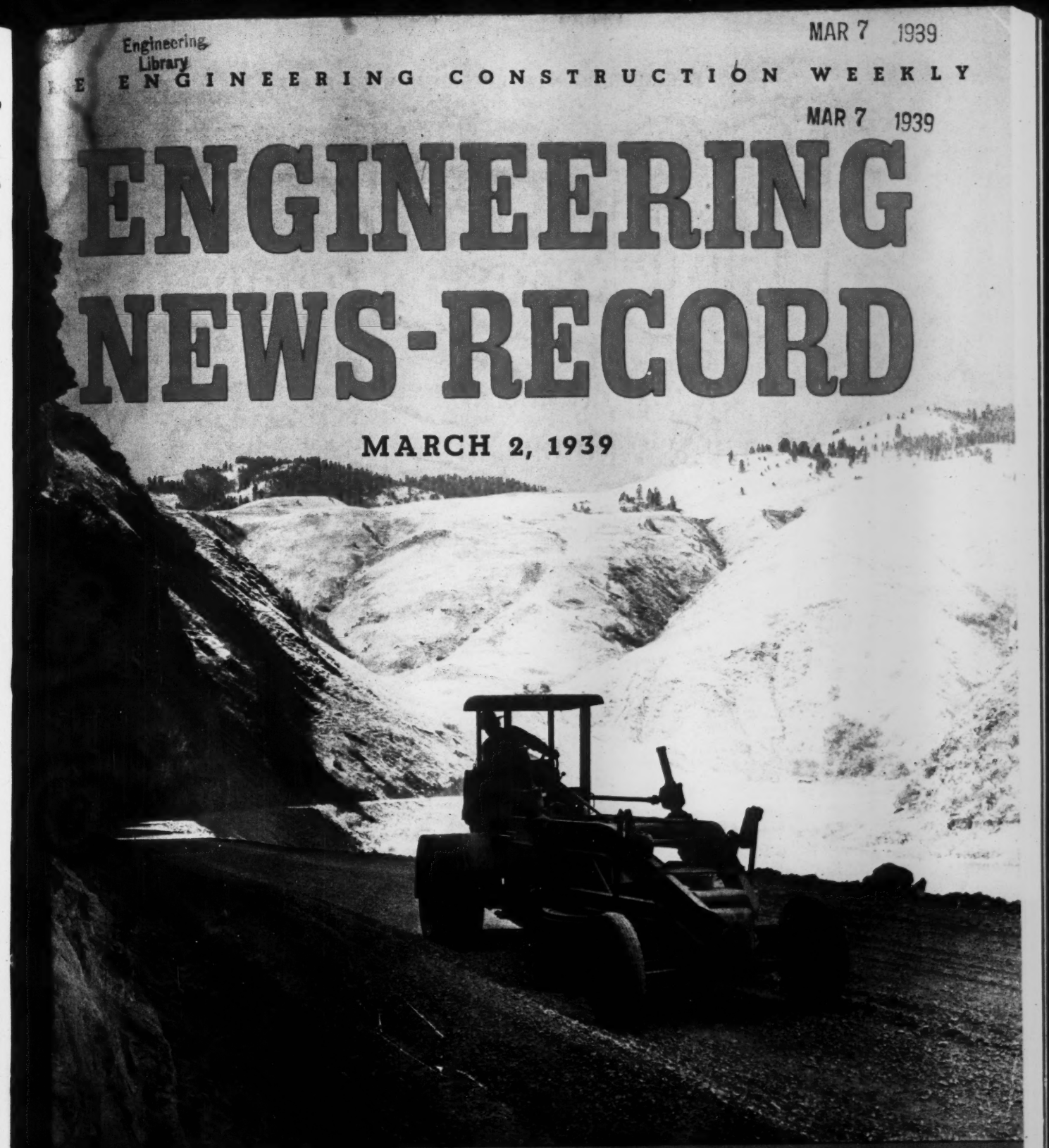

ANNUAL HIGHWAY NUMBER

Including Review of New Construction Equipment

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ANNUAL HIGHWAY NUMBER

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IN THIS ISSUE

THIS WEEK the road builders, general contractors and construction equipment men of the nation are gathered in San Francisco for the Road Show and for the conventions of the American Road Builders Association, the Associated General Contractors of America, the Associated Equipment Distributors and the National Equipment Distributors.

Because attention is thus centered on roadbuilding, much of this issue is given over to that subject. Roadbuilding is treated quantitatively; how much of it is there to be and what will it produce in the way of employment, contracts and equipment orders?

Finally, as relatively few of our readers will see the equipment show, 40 pages of this issue are given over to an "equipment show in print."

THINGS TO COME

● New Jersey installed many miles of lighting on its highways during 1938 in a concerted effort to reduce night accidents. The first reports of results obtained to date will be given in the March 16 issue of *Engineering News-Record.*

● A major contribution to the structural engineers work is contained in a coming article on the direct design of continuous beams by L. E. Grinter.

● Concrete blocks are being used for paving the new approach tunnel for the George Washington Bridge, New York. The Port Authority now has granite block, brick and concrete block pavements under test in its vehicle tunnels.

Tons and Tons of Reinforcing In Stock for Immediate Shipment

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CONTRACTS AND CAPITAL

ENR CONSTRUCTION VOLUME AND NEW CAPITAL . . . FHA MORTGAGES

(,000 omitted)	February 1938 (4 wks.)	February 1939 (4 wks.)	% Change	Two Months 1938 (8 wks.)	Two Months 1939 (8 wks.)	% Change
Total Construction Volume	$209,481	$203,843	−3.0	$399,667	$515,536	+29.0
Private	86,766	68,450	−21.0	166,233	119,741	−28.0
Public	122,715	135,393	+10.0	233,434	395,795	+70.0
Federal	45,291	15,261	−66.0	58,203	46,613	−20.0
Total New Productive Capital	$85,457	$356,874	+318.0	$129,856	$426,424	+229.0
Private Investment	88,986	75,736	−15.0	130,244	137,248	+ 5.0
Federal (non-federal work)	−3,529	7,638	.....	−388	15,676	.....
Federal (federal work)	.....	273,500	.....	.....	273,500	.....
FHA Mortgages Selected for Appraisal. * *Preliminary.*	$42,613	$83,252*	+95.0	$72,517	$153,403*	+112.0

CONSTRUCTION COSTS . . . WAGE RATES . . . PRICES

	March 1938	March 1939	% Change	Change February to March 1938 Feb.	1938 Mar.	%	1939 Feb.	1939 Mar.	%
E N R Construction Cost Index, 1913 = 100	238.79	234.43	−1.8	238.99	238.79	−0.1	234.31	234.43	+0.1
E N R Building Cost Index, 1913 = 100	199.29	196.46	−1.4	198.99	199.29	+0.2	196.23	196.46	+0.1
ENR 20-CITIES' AVERAGE									
Common Labor	$0.675	$0.680	+0.7	$0.675	$0.675	0	$0.680	$0.680	0
Skilled Labor (Av. 3 trades)	1.396	1.435	+2.8	1.391	1.396	+0.4	1.432	1.435	+0.2
Bricklayers	1.480	1.514	+2.3	1.480	1.480	0	1.514	1.514	0
Structural Ironworkers	1.448	1.500	+3.6	1.442	1.448	+0.4	1.494	1.500	+0.4
Carpenters	1.263	1.290	+2.1	1.251	1.263	+1.0	1.288	1.290	+0.2
Cement, per bbl	$2.55	$2.57	+0.8	$2.54	$2.55	+0.4	$2.58	$2.57	−0.4
Reinforcing Steel, cwt	2.86	2.48	−13.3	2.91	2.86	−1.7	2.48	2.48	0
Structural Steel, Pitts	2.25	2.10	−6.7	2.25	2.25	0	2.10	2.10	0
Sand, per ton	1.27	1.23	−3.1	1.25	1.27	+1.6	1.26	1.23	−2.4
Lumber, 2x4 Fir, per M ft.	34.15	32.55	−4.7	34.49	34.15	−1.0	32.38	32.55	+0.5
Lumber, 2x4 Pine, per M ft.	29.03	29.21	+0.6	29.09	29.03	−0.2	29.15	29.21	+0.2
Brick, common, per M	14.24	14.00	−1.7	14.24	14.24	0	14.00	14.00	0
Ready-mixed Concrete, c.y.	7.39	7.13	−3.5	7.39	7.39	0	7.18	7.13	−0.7
Struct. Clay Tile, 3x12x12	74.55	74.48	−0.1	74.55	74.55	0	74.48	74.48	0
Paving Asphalt, cars, ton	16.40	13.75	−16.1	16.84	16.40	−2.6	13.75	13.75	0

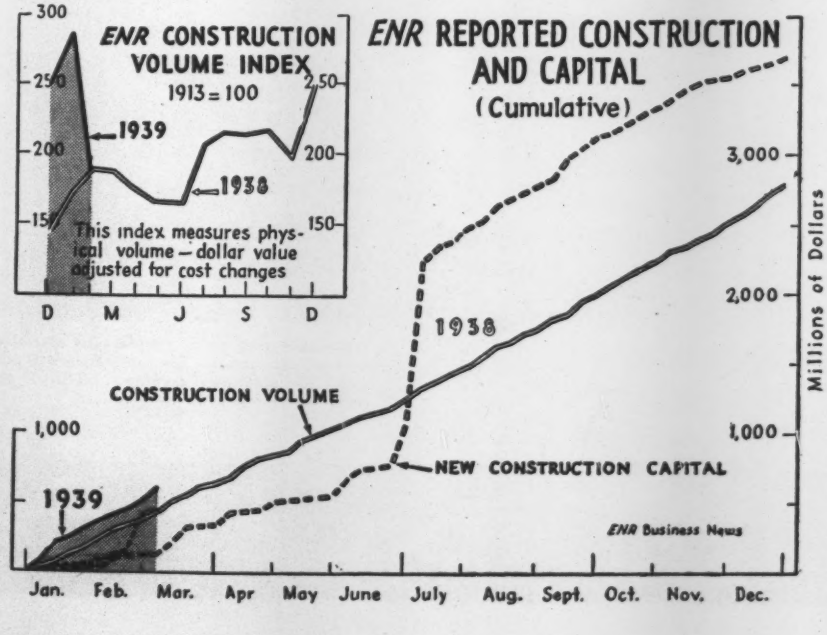
MATERIAL SHIPMENTS . . . BUILDING PERMITS

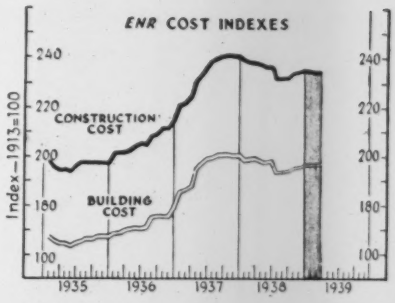
	February 1938	February 1939	% Change	Jan. 1939	% Change Jan.-Feb.
Lumber (% 1929 wk. av.) N.L.M.A.	52.0	61.0	+17.3	56.0	+8.9
Steel (% operating capacity) A.I.S.I.	30.7	53.7	+75.0	51.6	+4.1

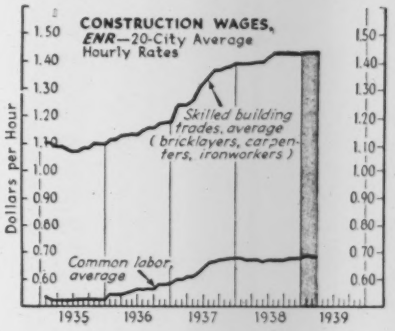
	January 1938	January 1939	% Change	Dec. 1938	Jan. 1939	% Change
Fabricated Struct. Steel, tons, A.I.S.C.	87,763	91,141	+3.8	106,457	91,141	−14.5
Cement, thous. bbl. U.S.B. of M	4,390	5,640	+28.5	6,281	5,640	−10.2
Building Permits, Dun & Bradstreet, (,000 omitted)	$146,866	$94,720	−35.5	$89,582	$94,720	+5.7

RENT INDEX . . . EMPLOYMENT

	January 1938	January 1939	% Change	Dec. 1938	% Change Dec.-Jan.
Rent (Housing) Index, N.I.C.B.	88.2	86.2	−2.3	86.2	0
Trade Unions, % Employed, A.F.L.	85.0	84.0	−1.2	80.0	+5.0
Building Trades, % Employed, A.F.L.	67.0	65.0	−3.0	60.0	+8.3







CONTRACTS

(Thousands of dollars)

	Week Ending Mar. 3 1938	Feb. 23 1939	Mar. 2 1939
Federal	$4,965	$4,345	$1,345
State & Municipal	19,076	30,957	60,883
Total public	$24,041	$35,302	$62,228
Total private	14,611	25,561	23,377
TOTALS	$38,652	$60,863	$85,605
Cumulative 1939 (9 weeks)			$601,141
1938 (9 weeks)			$438,319

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	Cumulative 1938 9 Wk.	1939 9 Wk.
NON-FEDERAL	$148,375	$160,736
Corporate securities	76,230	31,387
State & Mun. bonds	72,533	113,673
R.E.A. loans	.....	15,631
R.F.C. loans	2,109	45
PWA allotments	—2,497	.....
FEDERAL	.....	$273,500
TOTAL CAPITAL	$148,375	$434,236

FHA MORTGAGES

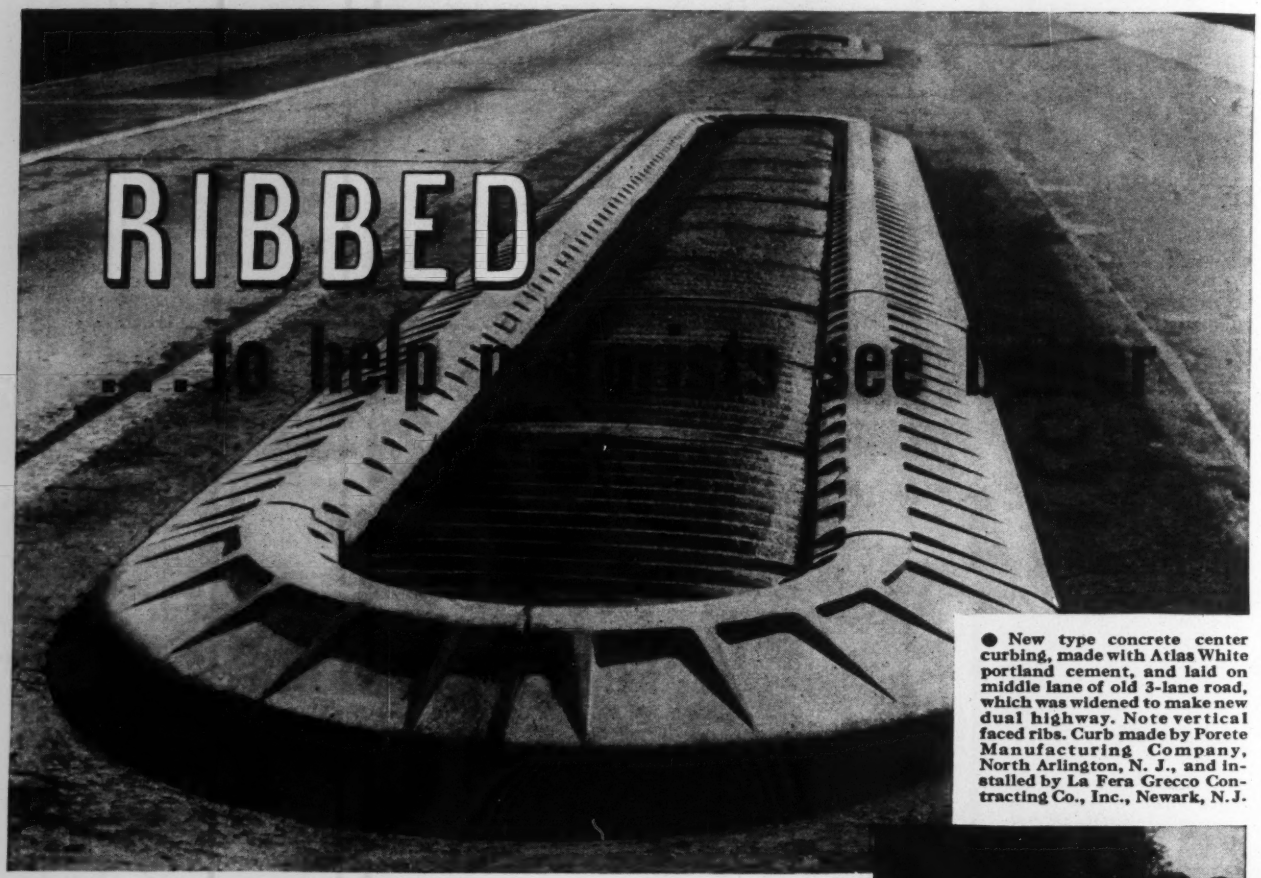
	Week Ending Feb. 26 1938	Feb. 18 1939	Feb. 25 1939
Selected for appraisal	$13,100	$20,458	$21,300*
Cumulative 1939 (8 weeks)			$151,403*
1938 (9 weeks)			$73,794

* Subject to revision.

ENR INDEX NUMBERS

Base = 100	Construction Cost 1913	1926	Building Cost '13	'26	Volume '13	'26
Mar., 1939	234.43	112.69	196.46	106.20	...	...
Feb., 1939	234.31	112.63	196.23	106.08	187	82
Jan., 1939	234.72	112.83	196.24	106.08	287	126
Mar., 1938	238.79	114.79	199.29	107.75	188	82
Feb., 1938	238.99	114.85	198.99	107.65	189	83
1938 (Av.)	235.86	113.34	196.83	106.40	197	86
1937 (Av.)	234.71	112.66	196.15	106.07	172	75
1936 (Av.)	206.42	99.15	172.18	93.14	185	81
1935 (Av.)	196.44	94.43	165.76	89.65	134	59

February construction table on page 77.



● New type concrete center curbing, made with Atlas White portland cement, and laid on middle lane of old 3-lane road, which was widened to make new dual highway. Note vertical faced ribs. Curb made by Porete Manufacturing Company, North Arlington, N. J., and installed by La Fera Grecco Contracting Co., Inc., Newark, N.J.

Driving at night and in rain or fog made safer by new type of white concrete curbing, on New Jersey Route 29

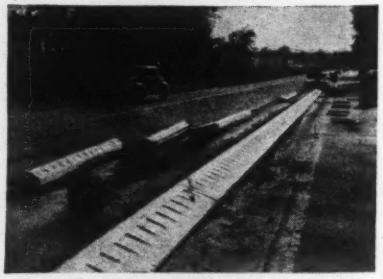
HERE'S a new type of construction to make driving safer—center curbing with vertical faced ribs. It carries the safety features of white concrete a step farther—particularly for night driving. The ribs increase visibility by reflecting car lights back toward the motorist. In fog and rain they help to make driving easier and safer.

The State of New Jersey has given this new precast safety curb, made with Atlas White portland cement, a severe test—a year's use on one of the heaviest travelled routes leading into New York City. Result: Other similar projects are planned this year. Wherever existing highways are being improved and widened, this new concrete curbing can be installed easily and economically.

Highway officials know the advantages of white concrete curbing and markers, which give permanent visibility and require no maintenance. They do not need repainting. There are no repairs or replacements. Installation is simple. No specially trained labor is needed.

Here's a suggestion. Keep traffic running smoother; eliminate maintenance costs; reduce accidents—all with Atlas White Cement. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), Chrysler Building, N. Y. C.

These precast sections of concrete curbing, made with Atlas White portland cement, were moved easily to the job.



Installation was quick, simple... no specially trained labor needed. The large picture at top shows the completed curbing... There's no maintenance when this job is finished.

NR-M-2

ATLAS WHITE

ENGINEERING NEWS-RECORD

Volume 122 MARCH 2, 1939 Number 9

Committee Disapproves Reservoir Level Law

A bill in the Texas legislature which would have required the Lower Colorado River Authority, a state agency, to keep the reservoir behind Buchanan Dam half empty except at flood periods has been unfavorably reported by the committee on criminal jurisprudence of the Texas House of Representatives. Introduction of the bill into the Texas legislature arose out of charges that during the flood of July, 1937, the authority failed to operate the dam in such manner as to obtain maximum flood control benefits.

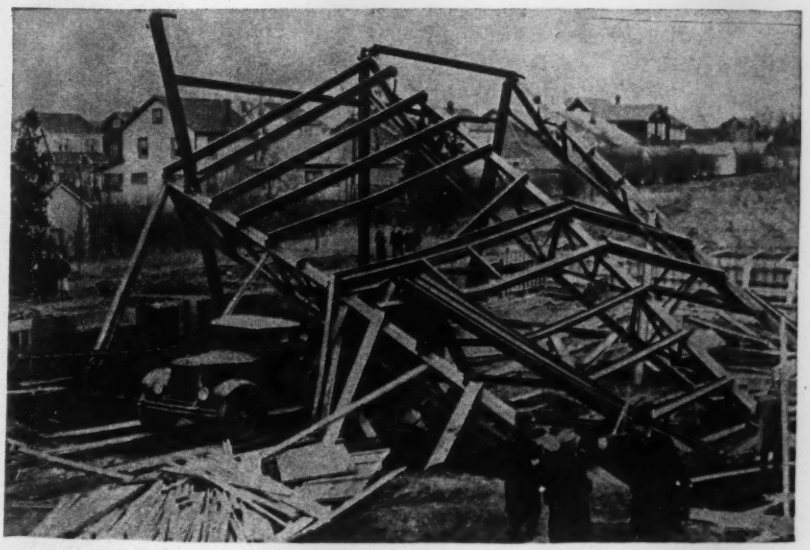
The committee's opposition to the bill was based primarily on the contention that it would amount to a repudiation of LCRA's contract with PWA and so would be likely to result in withholding of future federal grants to Texas. Opponents of the bill also contended that adequate flood control would be available when Marshall Ford Dam, another LCRA project, was raised to 275 ft. The dam is now being built to a height of 190 ft., but it is so designed that the foundations will carry the higher dam.

• • •

Water District Formed At Grand Coulee

Landowners of central Washington voted last month to form the largest irrigation district in the country—the first of two districts which will be furnished with water from Grand Coulee Dam. The district comprises 500,000 acres.

It is planned to build a network of canals during the next three years.



Wide World Photo

CRANE PULLS STEELWORK DOWN

STEEL for a high school building under construction at Hillside, N. J., fell down last week when the hook of the crane erecting the steel caught in one of the trusses. The steel fell onto the crane, killing the crane operator.

According to Hugh A. Kelly, of Jersey City, engineer on the project, six 30-ft. steel columns had been erected with all anchor bolts in place. Three 58-ft. double-Warren roof trusses had been placed, temporarily fastened with driving pins and bolts. When the steel fell, the anchor bolts sheared but did not pull out. H. R. Goeller, Inc., is the steel erection contractor.

Army Recommends Ohio-Erie Canal

But President suggests reduction in rail rates might achieve same results as canal construction

Construction of a lock canal to connect the Ohio River with Lake Erie via the Beaver, Mahoning, and Grand River valleys was recommended by the Chief of Engineers in a report submitted to Congress Feb. 21. Cost to the federal government is estimated at $207,257,000, with an additional local contribution of $14,156,000 bringing the total to $240,066,000. Minimum depth would be 12 ft., with a prevailing width of 250 ft., and a minimum width of 200 ft. With an estimated potential traffic of 27,746,000 tons annually it is believed that benefits would exceed costs by approximately $8,000,000 per year.

The report was transmitted without recommendation by the Secretary of War or by the President, but was accompanied by correspondence raising several questions regarding the advisability of proceeding without further study. A letter from President Roosevelt to the Secretary of War noted that he had asked the Interstate Commerce

(*Continued on p. 70*)

• • •

Illinois Contractors Exempt From State Sales Tax

Illinois contractors need not pay the 3 per cent state sales tax on building materials they have purchased, the state supreme court held Feb. 20 in granting an order for refund of taxes already paid. The court's decision upheld a Cook County circuit court ruling which held for the contractors on the ground that they performed a service.

In arguing against the order for refund, the state had contended that, since the contractors had presumably included the amount of the sales tax in their bids, the refund would constitute a windfall to which they were not entitled.

Florida Canal Held Justified

Department of commerce revises its 1934 report on basis of increased traffic

Completion of the Florida canal would result in material benefits to transportation "affecting commerce in areas comprising approximately 45 per cent of the United States and 74 per cent of the population," the U. S. Department of Commerce held in a report bringing up to date its 1934 report on the canal. The department found that its previous computation should be revised because the volume of Gulf commerce which would use the canal more than doubled between 1931 and 1937 and also because the proposed bottom width of the canal has been increased from the original 200 ft. to 400 ft., decreasing transit time by 1.55 hours and increasing the saving per ton of cargo from 13.8 to 14.8 cents.

On this basis, the total direct saving to through commerce is calculated at $13,499,000 which, plus benefits to local commerce estimated at $1,435,000, yields a direct saving, which would have been realized had the canal been in operation during 1937, of $14,934,000.

See also story on page 76.

FLOATING SWING SPAN ON FLORIDA BRIDGE

ECONOMY in providing a crossing for the Intra-Coastal Canal over which logs can be brought to supply a saw mill at Port St. Joe, Fla., was obtained by designing a swing span mounted on a floating barge instead of a center pier. The span is swung by means of propellers powered by two marine motors. The draw span consists of two 90-ft. steel girders weighing 45 tons.

The girder is shown being placed on the barge at the docks in Mobile, whence it was towed to the Intra-Coastal Canal.

The design and method of operation of the canal crossing were developed by J. B. Converse & Co. of Mobile, consulting engineers on the project.

• • •

Army Engineers Approve Ohio-Lake Erie Canal

(Continued from page 69)

Commission to study the proposal and its effect upon railroads in the area, and also pointed out that embarking on so large an undertaking would necessitate the postponement of other projects.

In his letter to the I.C.C. the President called attention to a finding of the Board of Engineers for Rivers and Harbors that a reduction of $0.29 per ton in rail rates would wipe out the economic justification for the project. ". . . If rail reductions are to be made, as is usually done to meet water competition," stated the board, "it would be advantageous to both the railroads and the United States for such reductions to be made before large obligations are incurred for construction."

"In view of this report," wrote the President, "I wish that the commission would undertake an investigation of rail rates in the area affected . . . so that the commission may advise me on whether or not rate reductions of the magnitude and type noted above would be economically justified. I presume that such review would require consideration of . . . the effect which construction of the project would have on rail and motor carriers."

Issues of policy were also raised by Frederic A. Delano, who wrote to the President in his capacity as chairman of the advisory committee of the National Resources Committee. Delano pointed out that the canal has already been authorized by Congress in the Rivers and Harbors Act of 1935, subject to the approval of the project by the Board of Engineers for Rivers and Harbors. Since it now has this approval the only bar to starting construction is a proposal to modify the requirements for local participation in costs proposed by the Chief of Engineers which, it is believed, must have additional Congressional approval. (This modification is that the United States pay for the reconstruction of existing railroad bridges).

Referring to the probable effect of construction upon existing modes of transportation, Delano raises the question whether "at a time when railroads generally are used far below capacity, it is making effective use of available construction funds to build a waterway to obtain benefits which might be obtained economically by readjustment in rail rates?" Corollary questions, he suggests, are: What would be the effect of the waterway upon the railroads? What is the present capacity of the railroad system in this area? Would the waterway increase the present concentration of industry in the Youngstown-Pittsburgh-Wheeling area, and would this be desirable?

"These issues," Delano wrote, "were not reported on by the Board of Engineers for Rivers and Harbors. In this and all other reports on navigation projects a balanced analysis of the transportation needs and facilities of all types in the regions concerned is lacking. There is not even an accepted technique for determining the transportation needs of an area. The advisory committee feels that the study embodied in the report is inadequate, and can be corrected only by analysis from a broader viewpoint."

• • •

Chicago Building Code Advisers Named

In the recently adopted Chicago building code is a provision for an advisory board of architects and engineers to revise the code as new developments arise. Members have now been appointed to this commission; the structural men are A. J. Hammond, P. L. Hein, R. R. Leffler, B. B. Shapiro, C. H. Westcott and A. Epstein. The honorary associates are Frank A. Randall, T. L. Condron, Magnus Gundersen, V. O. McClurg, J. C. Anderson and Albert Smith.

Pennsylvania Turnpike To Be Continued

Work on the Pennsylvania Turnpike, the 161-mile Pittsburgh-Harrisburg toll road along the line of the old South Penn Ry., will be continued, Governor James of Pennsylvania has announced. The new governor had hinted (*ENR*, Jan. 26, 1939, p. 3) that he might hold up work on the turnpike as he has already done on the state's flood control studies and on proposed projects of the General State Authority. James gave his approval to the $60,000,000 turnpike project after State Secretary of Highways I. Lamont Hughes had reported that the commonwealth is spending nothing on the work, which is being financed by PWA grant and an RFC loan.

Meanwhile, the shift in administration in Pennsylvania is still causing some confusion as to the status of projects of the Pennsylvania General State Authority. The governor has dismissed two Democratic members of the authority, but they have refused to admit his right to dismiss them. In consequence, payments due contractors on January construction estimates had not yet been made last week.

• • •

Former Highway Heads Accused in Pennsylvania

Indictment of Roy E. Brownmiller and the late Warren van Dyke, former secretaries of highways in Pennsylvania, was recommended Feb. 27 by the Dauphin County grand jury. The jury accused the officials of fraudulent waste of more than $600,000 of highway funds in Luzerne County, conspiracy to compel the awarding of surety bond business to a favored agency, and conspiracy to extort political funds from state employees.

Also recommended was indictment of H. H. Temple, who was dismissed in June, 1937, from his post as chief engineer of the highway department, in connection with the Erie County gravel-purchasing scandal (*ENR*, June 10, 1937, p. 854).

Rudy Arnold Photo

NEW APPROACH TO NEW YORK'S TRIBOROUGH BRIDGE

THE WESTERLY APPROACH to the Triborough Bridge through the Bronx, New York, is to be opened in time for the New York World's Fair and thus will provide an easy connection between the George Washington Bridge and the Triborough Bridge for through traffic from the West to Long Island, where the fair is to be held.

The main approach to the Triborough Bridge is at the top right, beyond the traffic circle where the Manhattan approach comes in after crossing the Harlem River lift span.

The new approach, after leaving the present Bronx approach, runs west in a new right-of-way cut between 134th and 135th St. nearby the Harlem River where it turns north to make connections with the Concourse. This westerly approach has been built by the Borough of Bronx at a cost of $5,410,000.

Stream Pollution Bill Introduced

New Barkley bill similar to last year's measure but includes changes urged by President

Within a few days after the submission to Congress of the National Resources Committee's report on stream pollution (*ENR*, Feb. 23, 1939, p. 1), the Senate commerce committee reported favorably on the Barkley bill, and on the same day Rep. Mansfield, chairman of the House committee on rivers and harbors, introduced a companion measure.

The Barkley bill would set up in the Public Health Service a division of water pollution control to cooperate with the War Department and other federal agencies and with state agencies and municipalities in preparing plans for improving the sanitary conditions of streams. The division would also supervise a program of federal grants and loans for the construction of treatment works, the extent of federal aid being limited to a maximum of 33⅓ per cent of the cost of labor and materials. Aid would be available both to local governmental agencies and to private persons, under the supervision of a board of five commissioned engineer officers of the Public Health Service. The board would study and approve projects much as does the present Board of Engineers for Rivers and Harbors in the field of navigation projects.

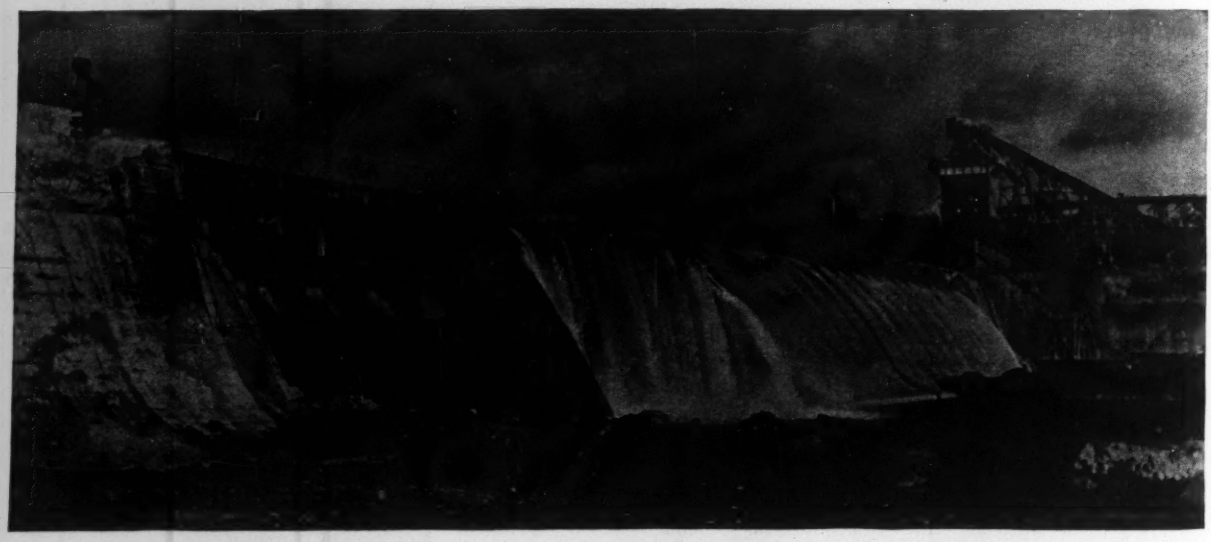
The bill is substantially the same as that passed by Congress last session and vetoed by the President because it contained no provision for the review of yearly appropriations by the Budget Bureau, a provision now contained in the proposed measure. It authorizes the annual appropriation of $300,000 for administrative expenses and $700,000 for loans and grants, and contains no provision for federal compulsion in pollution-abatement measures.

• • •

Contractors' License Laws Proposed in Two States

Laws to license contractors are now pending in Texas and in Ohio. If these are passed they will bring to sixteen the number of states having laws for licensing contractors.

The following states now have contractors' license laws: Arizona, Alabama, California, Florida, Georgia, Idaho, Louisiana, Montana, North Carolina, North Dakota, South Carolina, Tennessee, Utah and Virginia.



RENOVATION OF A FORTY-SIX YEAR OLD DAM. Originally constructed of stone and masonry in 1893 this dam across the Colorado River at Austin, Texas, lost its center section in 1900 and was given a hollow concrete section in 1915. Floods in 1936 ripped the downstream deck from this section. The Lower Colorado River Authority is now replacing the damaged section and reinforcing the dam and the foundation.

Reconstruction of Old Dam at Austin, Texas

Photos by P. C. Goode

RECONSTRUCTION is an old story for at least one section of the Tom Miller power dam (formerly Austin Dam) at Austin, Texas.

The whole dam was first built of masonry in 1893. A flood in 1900 destroyed the center section which was replaced by a multiple arch in 1915. The same year a flood swept away the crest gates, ruptured the sluiceways through the base and filled the tailrace with debris. Since then it has been out of service.

General renovation, which is due for completion in June, includes reconstruction of the frequently-damaged section, reinforcing and raising the intact part of the original structure, and strengthening foundation conditions.

Plans for replacement of the hollow section call for a gravity overflow section with flow controlled by radial gates. This section was built originally without a cutoff wall at the downstream edge—a condition which caused undermining.

For the raising operation, surface granite blocks are being roughened and cut into steps to which reinforcing for a new concrete sheath and crest is attached. A concrete cutoff wall is being built adjacent to the upstream face, and foundation grouting operations are under way.

The dam is being reconstructed by the Lower Colorado River Authority under Clarence McDonough, general manager.

MIXING PLANT for Tom Miller Dam reconstruction (left) uses aggregates trucked from a point two miles away. Concrete is chuted from the mixing plant to a receiving hopper on the platform in the foreground, whence it is transported by truck and lifted by cranes to position in the dam.

Contractor Held in Default On New York Building

L. P. O'Connor & Co., foundation contractors on the $18,500,000 Criminal Court Building now under construction in New York City, has been declared in default by City Commissioner of Public Works D. A. Huie. The contractor had stopped work on the project a few days earlier.

Huie said that although the contract for the caisson and pile foundation was to have been completed Feb. 14, only about a quarter of the work has been completed. The contract carries a penalty clause of $2,500 a day.

The contractor asserted that, because of the presence of large boulders not indicated by the city's borings, it has been impossible to complete the job under the plans and specifications. He said he had sought a change in the specifications and increased payments and that he would bring claim against the city.

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Terzaghi to Lecture At Princeton

Three lectures on foundations and soil mechanics are to be delivered by Karl V. Terzaghi at Princeton University, Mar. 27-28. Delivered under the William Pierson field lectureship, the lectures will be open to visitors.

The subjects are: "Recent Developments in Earth Pressure Theory," "Settlement Due to Open Cut and Tunnel Excavation," and "Experiences with Dams on Shales." The lectures will be followed by informal discussion, open to all present.

Terzaghi is at present on a short visit to the United States, during which he is serving as consulting engineer on the Chicago subway project.

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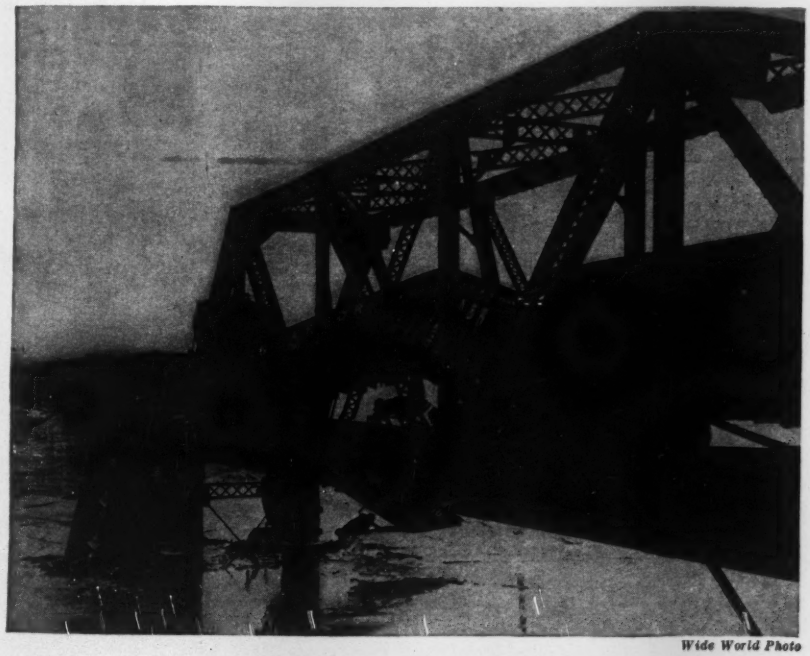
Excavation Completed At Ruby Dam

Foundation conditions at Seattle's $5,630,000 Ruby Dam on the Skagit River were approved Feb. 20 by J. S. Cotton, engineer representing the Federal Power Commission, and the first concrete for the project was placed on the following day.

The first batch of concrete, a mix of about 100 cu.yd., was placed in one of several potholes in the bedrock. The remaining potholes must be filled and grouting completed before continuous concrete placing can begin. Pouring operations are expected to continue for about a year, to bring the dam to its final height of 223 ft. above its base.



Wide World Photo

THIS BRIDGE CAN TAKE IT

WHEN A 95-CAR freight train struck a broken rail at this bridge near Dundee on the Ann Arbor R. R. line, fifteen cars were derailed and two were thrown into the Raisin River. Though several members of the trusses were badly damaged the bridge stood up.

The locomotive did not leave the tracks, and no one was injured or killed in the accident.

Reorganization Bill Is Introduced

Corps of Engineers and Federal Power Commission may not be changed by President

Representative Cochran, of the special House reorganization committee, introduced on Feb. 23 a "compromise" government reorganization bill similar to the measure defeated last year, but omitting some of its more controversial features such as curtailment of the powers of the Comptroller General and substitution of a single civil service administrator for the present five-man board. The bill specifically exempts from reorganization the following agencies: Corps of Engineers, Federal Power Commission, Federal Communications Commission, Federal Trade Commission, Civil Service Commission, Coast Guard, Interstate Commerce Commission, General Accounting Office, Bituminous Coal Commission, National Labor Relations Board, and a few minor agencies.

In general, the bill authorizes the President to draw up a reorganization plan within the executive department of the government and submit it to Congress not later than Jan. 21, 1941. This plan would become effective in 60 days unless blocked by a concurrent resolution of both houses of Congress. It also authorizes six administrative assistants for the President and requires the independent agencies to submit their requests for appropriations to the Budget Bureau.

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Gilbertsville and Watts Bar Restored to TVA Bill

The appropriation of $12,500,000 for continuation of work on the Gilbertsville Dam and an appropriation of $4,500,000 to begin the Watts Bar Dam, which were stricken from the TVA appropriation in the independent offices bill by the House last month (*ENR*, Feb. 16, 1939, p. 38) was restored last week by the Senate. The bill has gone to conference and the House conferees have accepted the Senate's form of the measure.

Another feature of the independent offices bill which had aroused interchamber controversy was an appropriation to meet the Federal Housing Administration's payroll for the final quarter of the current fiscal year. Approved by the House, this provision was voted out of the bill by the Senate. The conference committee dropped the provision, but the funds were provided in a separate resolution hastily passed by both houses.

State Names Engineer On Dennison Dam

Oklahoma governor wants to measure loss to state from federal flood-control project

Following out the objections to the federal government's proposed Dennison Dam on the Red River in Oklahoma to which he devoted a large part of his inaugural address (*ENR*, Jan. 26, 1939, p. 2), Governor Phillips has requested Phillip C. Donnell to take a year's leave of absence from his post as dean of engineering at Oklahoma Agricultural and Mechanical College to act as consulting engineer for the state on the Dennison project. The governor has asked Donnell to report on the effect of the project on state school lands, land upon which the school land commission has made loans, and also the effect upon various school districts and counties. He is also to report on the probable effect of the changing of the state boundary through construction of the dam. The Governor, in his inaugural address, pointed out that the lake behind the proposed dam would wipe out the present boundary of the state, established on the south bank of the Red River.

Phillips has also asked the state highway commission to report on the changes in the state highway system and feeder roads which would be required by the construction of the dam. The commission will report on the cost to the state of such changes and on the portion of the cost which should be borne by the federal government.

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Florida Cement Tax Held Unconstitutional

Imposition of an inspection fee of 15c. per hundred pounds on all cement imported into the state of Florida from foreign countries was held to be unconstitutional by the U. S. Supreme Court on Feb. 27. The opinion, delivered by Justice Frankfurter (his first since his appointment), held that the assumption that cement coming from abroad must be inspected to safeguard the public safety, while the 70 per cent of the state's consumption produced domestically requires no such precaution, is "too violent" to justify the discrimination imposed.

The court also cited uncontradicted evidence to the effect that the fee imposed is "sixty times the actual cost of inspection". Taking all evidence into consideration, the court found that the real purpose of the statute was to bar foreign cement from the state and held that this is beyond state jurisdiction.

L. V. CARPENTER
will study landfills

Land Fill Research Started at N.Y.U.

New York University, in cooperation with WPA, has begun a research program on the landfill method of refuse disposal in order to gather basic data on the biological and physical factors involved. The work will be done under the direction of L. V. Carpenter, professor of sanitary engineering, who will use about 120 laboratory and field workers. The investigation, which will require about a year, is being financed by a WPA allotment of $134,000, according to New York City Commissioner of Sanitation William F. Carey.

The city's department of sanitation, which has been cooperating with N. Y. U.'s College of Engineering on studies of sanitation matters, is acting as sponsor of the WPA project.

An advisory counsel of sanitary engineers and public health officials has been formed to guide the research program. Men who have been invited to become members of the counsel include Thorndike Saville, dean of engineering at N. Y. U.; F. E. Schmitt, editor of *Engineering News-Record*; A. F. Dappert and C. A. Holmquist of the New York State department of health; Frank W. Herring, executive secretary of the American Public Works Association; Seth G. Hess, chief engineer of the Interstate Sanitation Commission; Arthur P. Miller of the U. S. Public Health Service; John C. Riedel and Vernon S. Moon, present and former chief engineer, respectively, of the bureau of engineering of the New York City Board of Estimate; Earle B. Phelps, professor of sanitary science of Columbia University; Dr. John L. Rice, commissioner of health of New York City; Arthur S. Tuttle, consultant to the WPA; and Abel Wolman, pres. American Public Health Association.

East River Tunnel Work Maintained on Schedule

Progress on the East River vehicle tunnel to connect Manhattan and Queens, New York City, is on schedule despite the interruption caused by fire in the north heading last June, (*ENR* June 30 p. 889), according to Ole Singstad, chief engineer, and John S. MacDonald, construction manager for the Walsh Construction Co., contractor. The south tunnel has crossed the west channel of the river and is entering the rock reef which rises in the middle of the river. The face is at present almost wholly in Fordham gneiss, only a small part of the top of the face being in soft ground. The north tunnel has been kept about 100 ft. back of the south tunnel since the fire, but will also shortly enter the reef.

Progress on the east or Queens end has gone forward without difficulties as great as those encountered in going through heavy riprap near the west or Manhattan end. The rate of progress on the tunnel as a whole is such that the work is fully up to the time schedule originally laid down, and completion is expected by fall, 1940, in accordance with the initial plan.

Contracts for different sections of the work are now so far let as to make it certain that the cost of the work will remain within the original estimate of $58,365,000, Chief Engineer Singstad states.

The two tubes of the tunnel have an external diameter of 31 ft., increased at the ends to 32 ft. 10 in.; the underriver length is 3,055 ft., the distance between portals 6,270 and 6,435 ft. for south and north tunnels respectively, and the total length 7,500 and 7,785 ft. respectively. Erection of the ventilation buildings is progressing toward completion, and a large part of the excavation for the approaches has already been done.

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Building Permits Up By 20 per Cent

With building permits issued last year for 245,000 dwelling units, residential construction during 1938 was larger than for any year since 1929, a report made public last week by the Bureau of Labor Statistics revealed. The 1938 figure was 40,000 units, or about 20 per cent, higher than the number of residential building permits issued in 1937. This was in spite of the fact that the first half of 1938 showed a decline from the 1937 level of permits.

Largest percentage gain over 1937 was registered in apartment units, in which class permits were issued for

65,512 units as compared with 49,164 in 1937. The largest number of units was provided for in single-family houses, of which 156,366 received permits last year.

New England was the only geographical section not recording an increase, the heaviest gains being registered in the Middle Atlantic States. Nearly 25 per cent of all the urban residential permits issued were for construction in New York City.

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Memphis Sewer Contract Is Cancelled

Because Walsh & Wells, Inc., of St. Louis had completed only a little more than half of their $427,000 contract for construction of part of the $2,000,000 Memphis sewer project, the city commission concelled the contract late last month. The contract, covering construction of a section of the Front St. intercepting sewer from Poplar Ave. northward, was supposed to have been completed in September, 1938.

The bonding company has employed the Nolan Construction Co. to complete the remaining half of the work. The Nolan company holds the contract for the other three sections of the sewer and has completed the tunnel in the section adjoining the Walsh & Wells section.

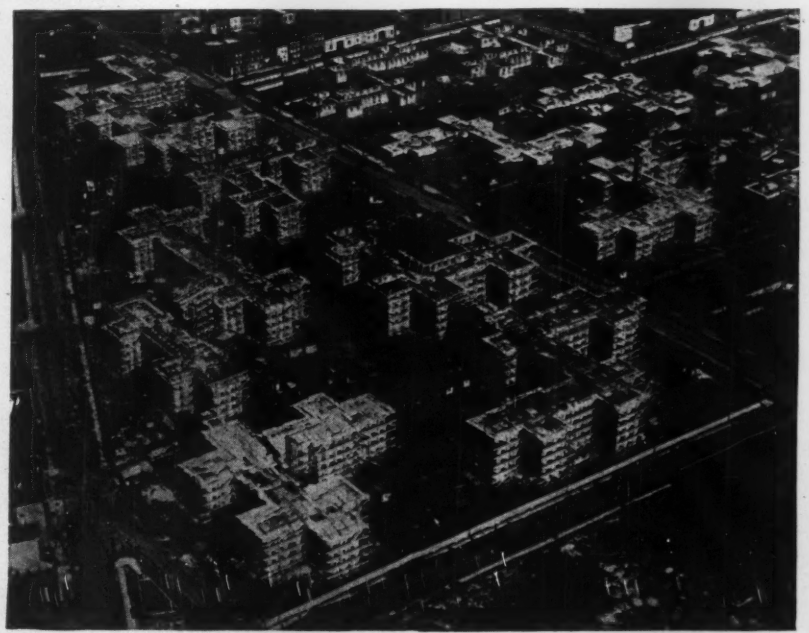
Identical Bidding Attacked in Suit

A new form of attack upon the practice of submitting identical bids on federal contracts was initiated last month when the Department of Justice filed suit to recover triple damages from 18 automobile tire manufacturers on the plea that the government had paid too much for tires during two six-month periods. The suit is filed under a section of the Sherman anti-trust act which provides that any person injured by procedures forbidden by the act may sue for triple damages.

In this case the government asserts that between October, 1936 and September, 1937, the government bought tires on the basis of bids identical to the penny. The government then declared that an emergency existed and bought tires at negotiated and considerably lower prices from Sears-Roebuck. Six months later non-identical and even lower bids were obtained.

It is the government's position that these facts establish a prima facie case of price fixing and that it is entitled to triple damages, measured by the difference between the prices paid under the identical bids and those paid under the competitive bids.

The government expects that if it wins this suit, bids will be competitive on other purchases.



Rudy Arnold

NEW YORK HOUSING PROJECT MOVES FORWARD

BUILDINGS are rising on the Red Hook USHA-financed housing project in New York City. This week the Mayor symbolized the fact when he laid the cornerstone for the project. First tenants are expected to move into the buildings this summer, which will make this the first USHA project completed.

LABOR NOTES

ENFORCEMENT, in connection with two naval steel contracts, of the 62½ cent minimum wage established under the Walsh-Healey Act in the eastern states by the Secretary of Labor has been temporarily enjoined at the request of seven small eastern steel companies. The companies, established outside the concentrated industrial areas, contend that the minimum is higher than the prevailing rate in their communities.

A VOLUNTARY reduction of wages has been effected by the Lincoln, Nebr., local of the International Hod Carriers, Building and Common Laborers Union. The rate for bricklayers' and plasterers' helpers has been reduced from 80 to 65 cents an hour, and the common labor rate from 60 to 50.

A SHIFT IN ALLEGIANCE from the AFL to the CIO of 22 men employed by a contractor on the railroad relocation work at Shasta dam has resulted in a jurisdictional dispute there. The operation involved is a small one, however, and the trouble is not interfering with major work on the project. United Concrete Pipe Co. is the contractor.

NEW YORK CITY plumbers, who have been working a six-hour day at $2.00 an hour, have accepted a new agreement, under which they will work a seven-hour day at $1.80.

DEMANDS for a shorter work week have been dropped by Elizabeth, N. J., bricklayers and plasterers, who have agreed to an eight-hour day at $13.50 after having demanded a $12.00 seven-hour day.

THE NATIONAL Labor Relations board has certified the Utility Workers Organizing Committee, CIO, as bargaining agent for production and maintenance employees of the Inter-State Water Co. of Danville, Ill.

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Illinois Housing Act Upheld by Court

The Illinois state supreme court upheld the constitutionality of the state housing act, which permits formation of local housing authorities, when it refused to enjoin the Peoria Housing Authority from making tax exemption contracts with the city of Peoria and loan contracts with the U. S. Housing Authority.

The court held that the state legislature had properly permitted cities to exempt housing authorities from taxation, that housing is a valid public purpose, and that bonds of the housing authority are not obligations of the city.

WASHINGTON HIGHLIGHTS

Special reports by Paul Wooton

PRICES of materials used in construction will come under the scrutiny of the Temporary National Economics Committee (monopoly committee) sooner or later, it is expected in Washington, although no official statement to that effect has yet been issued. It is known, however, that the Department of Justice, which has much material on this subject in its files, is engaged in preparing a report, presumably for presentation to TNEC, and that the work is being directed by Thurman Arnold, a member of the committee.

MODIFICATION of the authorized project for the improvement of the Connecticut River between Hartford and Springfield, Mass., has been recommended by the Secretary of War on the basis of a report by the Chief of Engineers suggesting construction of a lock, dam, and power plant at Enfield Rapids, Conn., and raising of bridges by local interests to provide a 20-ft. clearance. Estimated first cost is $12,344,000, with $200,000 annually for maintenance and operation.

THE PWA PROGRAM would be continued by means of an appropriation of $500,000,000, making loans and grants for projects that can be started by April 30, 1940, and completed by Dec. 31, 1941, under the terms of a bill introduced by Representative Starnes. The bill would make the Public Works Administration a permanent agency.

RECONSTRUCTION FINANCE CORPORATION, authorization for which would have expired June 30, has been continued in existence, along with its affiliated agencies, the Electric Home and Farm Authority and the Disaster Loan Corporation, until June 30, 1941. By the same act of Congress, the limit on loans by the Disaster Loan Corporation was arised from $20,000,000, to $40,000,000.

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World's Fair Inspectors Train at N. Y. U.

Sanitary inspectors for the N. Y. World's Fair will receive special training in a course to be given by New York University starting on March 9. The four weeks course is being given in cooperation with the World's Fair authorities. About thirty men will report for instruction in plumbing hazards, food inspection and pest control. The course is under the direction of Prof. L. V. Carpenter, who will be assisted by Prof. Lloyd Setter, both of the Sanitary Engineering Department of the University.

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House Hearings Start On Florida Canal

Major General Julian L. Schley, Chief of Engineers, was the first witness befor the House Committee on Rivers and Harbors in its consideration of the Florida Ship Canal starting Feb. 28. Declining to make any direct recommendation for or against authorization of the project, he testified that potential traffic has increased considerably since estimates were last made by the army in 1935. However, even a 40 per cent increase would still fall short of balancing costs and benefits, he said. He recommended that, if constructed, the canal upon groundwater levels in Florwide to accommodate all types of vessels and warned that spreading construction over a long period of time would greatly increase interest charges.

As requested by the Senate, the Geological Survey has reviewed its earlier report on the potential effect of the canal upon groundwater levels in Florida. In general, the revised report adheres to the view previously expressed—that the effect of the waterway would be detrimental for an indefinite distance on each side of its route.

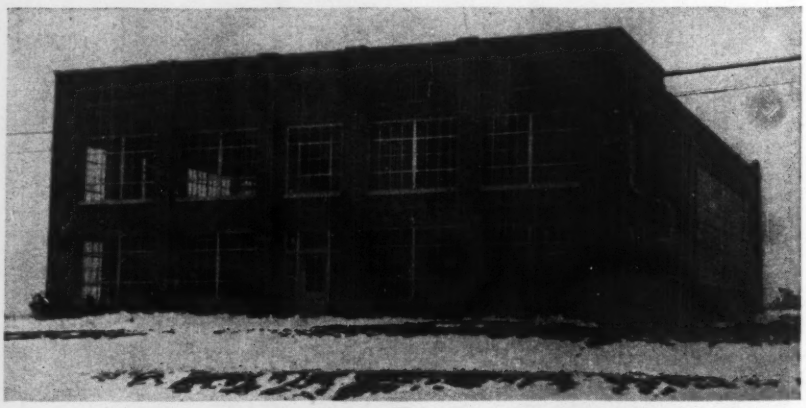
OBITUARY

JAMES J. DALEY, 66, a construction engineer formerly connected for many years with the J. G. White Construction Co. of Boston, died Feb. 18 in Youngstown, Ohio at the age of 66. Daley was a graduate of Stevens Institute of Technology.

WILLIAM E. PHIN, chairman of the Canadian Dredge & Dock Co., died at Hamilton, Ont., Feb. 16, at the age of 75. Phin entered contracting work in 1889. He was a director of the Hamilton Bridge Co.

C. H. OLMSTEAD, consulting engineer for the General Tarvia department of The Barrett Co., died in Washington Feb. 1 at the age of 47. Olmstead graduated in civil engineering from Cornell University in 1915 and worked for two years in the New York state highway department. After army service, he worked briefly for the Illinois highway department and in 1920 joined the Tennessee department, soon becoming district engineer at Nashville. He joined the Barrett Co. in 1928, being appointed consulting engineer in 1935.

LOUIS H. BARKER who retired 17 years ago as chief engineer of the Pennsylvania Railroad, died at Croton-on-Hudson, N. Y., Feb. 20, at the age of 87. Barker had been with the line for more than 40 years at the time of his retirement, entering the Pennsyl-



NEW HOME FOR ILLINOIS COUNTY HIGHWAYS

DEDICATED last month was this new county highway garage and office building for the Adams County, Ill., highway department. The lower floor of the 62x113-ft. building houses the office of county superintendent C. R. Baxter as well as offices for the assistants in charge of maintenance and construction. The rear of the main floor serves as a garage for the highway department's machinery, while the second floor will house the drafting and blueprinting room.

Clear floor space is provided by the steel truss design of the roof, without center support.

vania service in 1876 as assistant supervisor of the Northern Central lines. He rose steadily through the ranks of the Pennsylvania's engineering corps until he became assistant chief engineer in 1905. Shortly before his retirement he was made resident engineer in the New York area. Barker was a graduate of Brooklyn Polytechnic Institute with the class of 1871.

ALFRED F. MORRIS, chief of the real estate section of the Panama Railroad, died in Panama City Feb. 23 at the age of 65. A graduate of the University of Nebraska, Morris began his engineering career in Mexico and worked for many years in Panama, his career including work on the canal construction, the relocation of the Panama Railroad, and work as general superintendent of the fortification division. His last employment on the canal was as assistant engineer on construction of Madden Dam.

From 1926 until 1928, Morris was director-general of highways in Persia and a later date was engineer for Ulen & Co. on railroads in Persia and South America.

ALBERT A. PETERS, formerly European resident engineer for the Foundation Co. of New York, died Feb. 24 at his ranch near Sonoma, Calif., at the age of 57. A graduate of the University of California in 1907, he spent some years on waterworks and oil field projects and in 1912 joined the California highway commission at first as office engineer and later as assistant division engineer. He served during the war in the Engineer Corps and the chemical warfare service, rising to the rank of lieutenant-colonel. Afterwards he practiced for some years in San Francisco before joining the Foundation Co.

RALPH G. DAVIS, senior engineer in the War Department's beach erosion board, died Feb. 21 in Washington at the age of 50. A graduate in civil engineering from the University of Delaware, Davis had been with the War Department ever since his graduation in 1911.

FRIEND P. WILLIAMS, an engineer since 1921 for the New York State Water Power Commission, died in Albany Feb. 20. Williams, an 1899 graduate of Cornell, had been in the state's service since 1904. He served for several years as deputy state engineer in charge of construction of the barge canal.

ARTHUR S. BENT of the Los Angeles contracting firm of Bent Brothers died there Feb. 17 at the age of 75. Bent had been active in contracting work on the West Coast since 1886, important work carried out by his organization including the Sweetwater dam at San Diego, the Gibraltar dam at Santa Barbara, numerous waterworks and sewerage systems, and a considerable mileage of California state highways. Bent was a past president of the Associated General Contractors, a past director of the United States Chamber of Commerce, and was the head of a California Chamber of Commerce commission which drafted a state-wide code of earthquake resistant construction.

EDWARD A. TUTTLE, who was a member of the staff of the Los Angeles city engineer from 1901 until he retired in 1937, died Feb. 22 in Los Angeles at the age of 86. His accomplishments while in the city's employ included the design of the Hill St. vehicle tunnel and of the first municipal outfall sewer. From 1919 until 1930, Tuttle was in charge of all storm drain work in the city. Before joining the Los Angeles staff, he had been city engineer of Redlands, Calif. and had practiced in southern California on irrigation projects.

HIRAM J. BLACK, division engineer at Ottawa for the Canadian National Railway died in Ottawa Feb. 20. Before the war, Black worked with the Canadian Pacific and after railway service overseas during the war, he joined the CNR.

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23d Engineers Legion Post Gets Banner from ENR

Legion Post 820 of the 23rd Engineers, Chicago, was presented on Feb. 21 with an American Legion banner by *Engineering News-Record* in commemoration of the part played by this journal in recruiting the great highway construction regiment of the American Expeditionary Force through a campaign begun in its issue of Oct. 4, 1917. J. M. Rodgers, vice president of McGraw-Hill Publishing Co., made the presentation.

William Buxman and S. T. Henry, both of the *ENR* staff, who conceived the idea of recruiting men needed for road work in France through the pages of ENR, recounted the recruiting experience which resulted in the army receiving 20,000 applications, only half of whom could be accepted. J. Soule ("Speed") Warterfield, as the master of ceremonies, presented Buxman with a pick and shovel which have become emblematic of the regiment, many men having gone into the outfit on the assumption that they were to do engineering work in France, only to find that their principal technical tools were picks and shovels.

Further news on page 164.

ENGINEERING CONSTRUCTION CONTRACTS REPORTED BY ENGINEERING NEWS-RECORD, IN FEBRUARY, 1939

Engineering News-Record *reports projects of the following minimum costs; — water-works, excavation, drainage and irrigation,* $15,000; *other public works,* $25,000; *industrial buildings,* $40,000; *other buildings,* $150,000.

Four Weeks — Thousands of Dollars (000 Omitted)

Public Works	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States February 1939	United States Two Months 1939	United States Two Months 1938	Canada
Waterworks	245	2,362	866	1,163	1,669	942	7,247	38,702	4,819	618
Sewerage	746	4,455	764	4,967	3,607	1,465	16,004	35,637	19,854	103
Bridges, public	403	2,271	1,012	1,399	1,058	649	6,792	32,281	9,147	140
Earthwork and waterways	227	3,009	7,319	282	1,201	590	12,628	33,786	52,567	569
Streets and roads	1,003	5,079	7,439	5,048	15,703	1,728	36,000	98,251	56,253	894
Buildings, public	4,792	6,707	11,034	7,341	6,389	5,635	41,898	130,299	71,726	245
Unclassified, public	.....	3,621	2,549	3,640	2,487	2,527	14,824	26,839	19,068	223
Total public	7,416	27,504	30,983	23,840	32,114	13,536	135,393	395,795	233,434	2,792
Federal government (included in above classifications)	371	2,344	4,812	782	1,397	5,555	15,261	46,613	58,203	.....
Private										
Bridges, private	.....	20	.....	.....	.....	.....	20	876	2,176	.....
Buildings, industrial	197	911	7,670	1,110	1,243	566	11,697	20,368	43,112	527
Buildings, commercial	910	20,626	914	6,308	6,660	300	35,718	66,319	106,959	475
Unclassified, private	55	1,559	1,715	9,839	5,787	2,060	21,015	32,178	13,986	1,247
Total private	1,162	23,116	10,299	17,257	13,690	2,926	68,450	119,741	166,233	2,249
Total Engineering Construction:										
February, 1939 (4 weeks)	8,578	50,620	41,282	41,097	45,804	16,462	203,843	.....	.....	5,041
January, 1939 (4 weeks)	23,510	103,253	34,733	50,700	58,826	40,671	311,693	.....	.....	3,869
February, 1938 (4 weeks)	5,472	95,483	8,618	22,614	27,094	50,200	209,481	.....	.....	2,760
Two Months — 1939	32,088	153,873	76,015	91,797	104,630	57,133	.....	515,536	.....	8,910
Two Months — 1938	11,660	166,086	39,585	48,345	66,247	67,744	.....	.....	399,667	6,822

COMMENT AND DISCUSSION

Readers' opinions on matters that concern the engineer

Public Relations

Sir: The article on public relations in the field of municipal public works by E. J. Cleary (*ENR*, Dec. 22, 1938, p. 794) is very interesting and timely; it should be educational to many municipal officials who have not given this important matter much, if any, thought.

A municipality being a non-profit organization of its citizens to handle the affairs of their community for the best interests of all, everybody investing in the organization wants to know how his money is being spent. Any apparent secrecy in governmental operations tends to develop suspicions, neighborhood strifes and even outspoken criticisms, whether or not they may be warranted. A full understanding by as many people as possible of all the vital operations of government welds a municipality into a boosting unit and assures a successful administration of its affairs.

We have tried for a number of years to effect the establishment of a public relations bureau for the city of Miami as a whole, because we realize the vital need of such an activity. However, the needs of all operating departments have been so pressing in late years that new activities have had to be foregone. We expect to keep asking and it will materialize in due time.

C. S. NICHOLS,
Director of Public Service,
Miami, Fla., Dec. 30, 1938

Glue for Structural Timbers

Sir: Your reference to "Glue in Construction", in *ENR* of Nov. 3, page 548, in which you note that glues for outdoor exposed work are only recently available, brings to mind the old "marine glue" of sailing-ship days. In many cases the large sticks required for the lower masts were built up of three or four sticks put together with marine glue, which was of such strength that in tests to destruction the timbers would tear and split while the glued joints held. And this material had to withstand exposure to rain, snow, fog and salt air and spray, as well as the stresses, shocks and vibrations due to a wide spread of canvas in high winds and rough seas. One old specification for marine glue was as follows:

"1 part of india-rubber, 12 of mineral naphtha or coal-tar. Heat gently, mix, and add 20 of powdered shellac. Pour out on a slab to cool. When to be used, heat to about 250 deg."

E. E. R. TRATMAN
Wheaton, Ill., Nov. 14, 1938

Depression Engineers

Sir: With reference to the news item concerning Mr. Conlon's statement, July 14, p. 37, and the resultant comments of August 11, p. 164, and October 20, p. 483: this exchange of ideas has been interesting, and has prompted the following contribution on my part:

There is basis for the statistical element of Mr. Conlon's first statement. Many engineering graduates have left their chosen profession. Was the fault somewhere in the profession? Or in the choice? My classmates all knew that "Calculus is that branch of mathematics which makes 'Ags' out of engineers." Those unaware of the real nature of the engineer's work are often only too glad to find anything else when they discover what they have gotten into.

Mr. Conlon's last paragraph, together with Mr. Wherry's comment on the same subject, is open to question. Observation indicates that if the man who is furnishing "low-cost engineering services" is also furnishing first class engineering services, presently they are no longer "low-cost." The alarming turnover, in so far as it exists, appears to be principally an effort to find a man who can be trusted to go ahead and do a good job when the boss is out of town.

Mr. Moore is correct. The engineering graduate is not yet an engineer. He is merely introduced to the field in a technical sense. Further study will only broaden this technical background. Without a reliable judgment no man can justly claim to be an engineer. That comes from experience only. Nor can academic studies teach the art of working with and among men.

"Shining the apple" and "voting right" will help up to a point, maybe. Beyond there it is up to the man, and the use he can make of his education. He needs the education if he hopes ever to establish himself above hopeless mediocrity. The best way to "shine the apple" is to do a good job the way the boss wants it done. I must agree with Mr. Wherry that "voting right" seems to have an unhealthy significance in a society where governmental agencies are taking over an ever increasing variety of activities.

Naturally there are exceptions to all generalities. We call them the "breaks". But even so success as an engineer is still an individual matter. The last depression put many good men on the rocks, yet among my personal acquaintances alone are several "depression engineers" who stuck it out and are going strong today—as engineers.

ELMER MUNGER
Rodman, St. L. S. Ry. Co.
Pine Bluff, Ark.

Canal St. Bridge

Through an oversight, the name of James Stewart & Co., New York, general contractor on the Canal St. Bridge, 360-ft. tied arch structure on New York's West Side elevated highway, was omitted from the article in the Feb. 16 issue, p. 68.

Sewage Disposal Inventory

Sir: In reviewing the inventory of sewage disposal facilities (*ENR*, Jan. 19, p. 60) I am impressed with the fact that the table would indicate a very large number of communities in New York State whose treatment ends with screening. The total of communities having only screening with and without disinfection amounts to 38. This is a rather high proportion of the total for the whole country. In the list of communities having screening with disinfection 33 of the total 48 in the country are located in New York State. This data, without some explanation, would seem to reflect on New York State permitting a fairly low degree of treatment for a large number of municipalities. However,

I would explain, so that if questions arise, that the figures which we submitted referred to the actual number of communities, a great many of which are served by a relatively few screening plants, particularly by the four plants operated by the Westchester County Sanitary Sewer Commission which serve a total of 27 communities.

The outlets of two of these plants are from one to two miles off shore in deep water in Long Island Sound. The discharge of the other two plants is carried into deep water in the Hudson River.

It will be noted that there are only 17 plants in the state where fine screens are used either alone or as an integral part of a treatment process.

C. A. HOLMQUIST
Director, Division of Sanitation
New York State Dept. of Health

Lions' Gate Bridge

Sir: In your excellent article on the caisson construction for the Lions' Gate Bridge at Vancouver in your Feb. 16 issue, your concluding paragraph on personnel omits the name of our firm, Robinson & Steinman, as consulting engineers. On this bridge project, our firm was retained by the owners to review and check all designs and plans, including the proposed methods for foundation construction. In addition we had to make studies and reports on specific features of the work.

D. B. STEINMAN
Robinson & Steinman,
Consulting Engineers.
New York, Feb. 17, 1939.

Cement Developments

Sir: It is the writer's opinion that your statement in the Feb. 2 issue under the head of "Research" that cement in the 1938 period was inactive is misleading. One is likely to conclude that all the work in portland-puzzolan cements is in the laboratory and that nothing has been done with portland cement.

In this statement there is a percentage of error that should be corrected. Several things occurred in the cement industry in 1938 which are outstanding:

1. Approval of federal specification SS-C-208 portland-puzzolan cement.
2. Elimination of specification for fines by A.S.T.M. committee, C-1.
3. Admission by committee that bleeding or water gain would appear to be a function of a quality of a cement other than fineness.

In these three occurrences is tied up the eventual breakdown of the present conception that only completely burned and unadulterated portland cement is safe to use. They mean that eventually cement will be purchased on performance and not on arbitrarily selected chemical qualifications whose efficacy breaks down under close scrutiny.

CHAS. L. KIRK
Vice-President
Eddystone Portland Puzzolan Cement Co.
Pittsburgh, Feb. 7, 1939

A City "Sells" Itself

Sir: In reading the article "Selling Public Works to the Public" by E. J. Cleary, (*ENR* Dec. 22, 1938, p. 794), I was agreeably surprised to find that many of the suggestions made are already in use in Rochester. Regardless of whether a city spends much or little on public works, it should definitely strive for publicity which tells the taxpayer to what extent he is getting his money's worth. The complaint of the taxpayer is not always against the public works project itself. Often it arises from the unjustified suspicion that he is not getting full value for money spent.

Public relations are not neglected in Rochester. The city maintains a press room for the convenience of newspaper reporters next to the city manager's office, and cordial relations with the press are assured by furnishing impartial information. This past year a new department was added to the city government, known as the department of commerce, headed by a commissioner whose duty it is to supervise the utilities of the city, as well as to correlate the reports on the activities of the various other departments of the city, covering the work done during the year. Technical reports from various departments are rewritten by a director of public relations who works under the supervision of the commissioner, and these are made available to the public and to the City Council in a form that will not only be interesting but understandable. The annual consolidated report now being prepared by the department of commerce, will tell in picture and story the work of all major departments of the city government. The department recently promoted a series of fifteen-minute radio talks by city administrators, who explained in a popular manner the policies and work covered by their respective departments.

Our department of public works has made a number of moving pictures showing refuse collection, sewage treatment, snow removal and asphalt repairs, which have been used in the schools and at meetings as a means of educating the public. And at the annual Rochester Exposition this past season, each department of the city showed exhibits illustrating various phases of its work.

The American Association of University Women had for some years past held what is called a "Know Your City Day," at which time they delegate members of the local club to the City Hall and other city buildings to act as guides to conduct interested persons through the various departments where the work being done is explained by those in charge.

I believe that your article is very timely, and I am forwarding a copy to our director of public relations for his information.

HENRY L. HOWE,
City Engineer
Rochester, N. Y., Jan. 6, 1939

Mississippi Cutoffs

Sir: I have read with interest the letter from David A. Watt published in *ENR* Dec. 29 p. 809, and the editorial comment thereon published in the same issue.

I appreciate comments from a man so well versed in river hydraulics, whose book on "Improvement of Rivers" is very highly regarded amongst engineers familiar with river problems.

As is well known, no alluvial river is actually stable. Each variation in its ability to carry the load of material being transported produces some change in its characteristics. Width, depth, slope, cross-sectional area, bank heights, and material in banks and bed vary from point to point along the course of the stream and the trend of this variation is frequently reversed at high-water stage from that which it follows at low-water stage. It is probable that the ideal river would be one of uniform

(*Continued on page 176*)

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MARCH 2, 1939

BUSINESS waits on construction, says a business forecaster in appraising the current situation. His remark gains meaning in the light of 1938 history, when the steady rise in construction activity checked the general downward trend. Even more definitely is the influence of construction on other economic events revealed by the happenings of ten or twelve years past. Construction turned downward well before the 1929-30 collapse of business and credit, and in fact the highly sensitive activity of housebuilding passed its peak as much as four years prior to the general decline. Later, when recovery began, consumption and general manufacture leaped ahead, while construction was held back by discouragement of new enterprise and an unreconstructed medieval mortgage system. There followed the 1937-38 recession. But last year we witnessed a steady gain in construction leading the revival of business and industry. So it is natural to expect construction to lead in the 1939 advance. The year's record to date indicates that it will take the lead.

Beaver-Mahoning Canal

THE CHIEF OF ENGINEERS has sent to Congress a favorable report on the long-proposed canal to connect the Ohio River with the Great Lakes via the Beaver and Mahoning rivers. Past reports by army engineers on the project have been unfavorable but now savings in transportation charges have been found to justify the expenditure of about $200,000,000. None of the savings, however, will be returned to the federal government in tolls to repay it for its investment; they will go to the shippers who are supposed to pass them on to the public in return for the free use of the canal. And, of course, every ton of freight that moves through the canal will be taken from the railroads of the region, yet they will be expected to continue to serve the region just as fully as at present. It should be noted that the Chief of Engineers is not asked to weigh his estimated benefits against loss to the railroads. All of which serves to emphasize the unsoundness of our national policy with regard to waterways. N waterway should be free. Freight moving on an waterway should pay sufficient toll to offset th capital cost and upkeep. Until that requirement i made a fundamental national policy none can sa whether any new canal is justified as part of a unified transportation system.

Facts Instead of Prejudice

ANNOUNCEMENT that research on land-fill refuse disposal is to be undertaken at New York University is gratifying news. The research should provide data on a matter which has been grossly neglected by the sanitary profession, and on which there exists much prejudiced misinformation. A land fill is a controlled deposition of refuse; it is not a "dump." The controls practised on the New York City fills include deposition in layers, compaction, and prompt covering with an earth seal. These controls have thus far been applied empirically, and no study has ever been made of the biological and physical factors involved. The rich opportunities for research in this field and some of the questions that call for answer were pointed out in these pages several months ago. New York University, the New York City Department of Sanitation and the WPA, which is supplying much of the manpower, by this research program are rendering a service of national importance and are setting a shining example of cooperation between scientific institutions and practical operating agencies.

Gilbertsville Dam

SENATE AND HOUSE are in disagreement on whether or not the TVA shall have an additional appropriation of about $12,000,000 for continuing work on Gilbertsville Dam near the mouth of the Tennessee River, a project for which Congress last year provided $5,000,000 for preliminary work and studies of the difficult foundation conditions. Discussion is centered chiefly on cutting the TVA appropriation as a matter of economy, little being said as to the need for the Gilbertsville Dam or other projects of the TVA, though authorization of a $12,000,000 expenditure on Gilbertsville next year would seem to commit Congress to providing something close to $100,000,000 more to complete the project. Under these circumstances Congress should stop now to determine whether or not the high dam at Gilbertsville should be built at all. The chief claim for a high dam at the Gilbertsville site is that it will provide flood protection on the lower Ohio and Mississippi rivers, which are out of the jurisdiction of TVA, yet engineers familiar

with the Mississippi question its value for flood-control there. Such a situation calls for a report by an independent board of engineers. The TVA engineers now can tell what the total cost should be; this can be weighed against benefits determined by a board that can view the whole situation broadly. Last year's appropriation should not be looked upon as a commitment to build the high dam.

Battle Is Still On

THE CRY for motor-vehicle tax diversion is again sounding. Probably it will not get as ready hearing as it has had in the past few years but it should call road transport and the road-building industries to increased opposition. Proposals for diversion are now before the legislatures of seven or eight states, some being old offenders, while others are turning to diversion for the first time to get easy money at the expense of the road user. But the movement is not as universal as it has been. Encouraging notice can be taken of the fact that seven state governors have announced opposition to diversion. At their elections last fall the people of three states voted anti-diversion amendments to the state constitutions. The legislatures of several other states are being asked to put the question to popular vote. Until now the decision of the people, wherever its expression has been allowed, has been positively against diversion. But road-tax diversion has powerful proponents. Outstanding among them perhaps is the governor of New York who is now urging that the highway law that now gives road taxes to roads be changed so that this money will go into the general state fund. In all, there is no indication that the road user may safely cease his attacks on diversion. The battle is still on!

Better Organization

PROPOSALS to establish a public-works department in the federal government draw attention to a subject in which engineers and the construction industry as a whole have long been interested. This time, however, the plan includes some new features that invite close study. The bill of Senator Byrnes, generally considered an Administration bill, proposes to center in a public works department the building work of the Treasury Department and that of the Bureau of Public Roads together with the activities of the Works Progress Administration, the Civilian Conservation Corps, and the National Youth Administration. The way is left open for the transfer of the construction work of other federal departments to the new public works department.

For many years the engineering profession has favored centralization of federal public works in a single department as a means of attaining higher efficiency, eliminating wastes, and doing away with divergent practices that are harmful to public and to construction interests alike. Experience with the greatly enlarged works program developed to meet the depression emergency furnishes additional argument for single-headed direction of works: the fact that many different agencies, both experienced and inexperienced, arbitrarily enforce their individual notions of good procedure, has resulted in much difficulty, delay, and loss of quality and economy.

The belief that a federal public-works department would be a valuable improvement in our national public service is therefore well established doctrine. Differences of opinion remain as to whether all construction should be turned over to this department or whether certain special types of work are better left outside, but such differences need not affect a decision on the merits of the fundamental plan. Each should be considered separately from the main question.

Inclusion of relief activities in the proposed public-works department raises a new and serious question, however. Would not a works department, which is necessarily devoted to good and economical construction for best service to the public, compromise this purpose by operating in a relief and welfare atmosphere?

As to the WPA, the answer to this question probably depends on methods more than on inherent principle. Were the construction operations of the WPA placed under regular public-works department procedure and in all respects fitted to the normal requirements of efficient construction, the inclusion of this relief organization in the new department could perhaps be made workable, under appropriate safeguards. On the other hand the CCC and NYA have so essentially relief character that it would be difficult if not impossible to harmonize them with the functioning of a public-works department. Except for some possible opportunities for apprenticeship training on actual construction, the purpose for which these bodies were organized could not be effectively served, and at the same time the public-works operations would be in grave risk of disorganization.

The Byrnes bill thus bears directly on construction interests in more than one way. In passing on the bill, Congress should have the best advice that the experience and judgment of construction men can give to those who perfect the legislation.

Toward Construction Cooperation

FOR SOME YEARS PAST it has been customary to speak of the construction industry when referring to the engineers, contractors, equipment and material supply men who build the works that serve man's convenience and enterprise and that invest his savings. This "industry" is of direct effect on general prosperity because of the size of its operations and the employment it creates, as well as its money turnover. As a major element of the country's productive system, it should exert a large influence on public and business affairs. The record does not show that it has done so. Why?

Light is thrown on this question by a recent meeting of the Construction League, when the proposal was made that the organization, the only central forum of the industry, be disbanded for lack of adequate support. There was evident the strong individualism that has always characterized construction men and that stands in the way of active realization of joint interest. Yet without such realization the several parties to construction operations can hardly claim to form a unit or expect to be recognized as an influence in public life.

Individualism also is the keynote of the current California gatherings, where various construction groups are meeting simultaneously but apart from each other. Contractors, roadbuilders, asphalt interests and highway officials are assembled independently, each group concerned with its own affairs, and taking too little advantage of the viewpoint of other groups.

Yet construction as a whole is faced with many problems, small and large, that can effectively be dealt with only by joint discussion and action. Not a few of them affect the general public, and if they are not solved from within it appears certain that in due course they will be solved by outside dictation. If construction is not now a unit, it has the strongest of reasons for seeking to organize as a unit.

* * *

Examples of divergent interest and absence of a common outlook respecting common problems are not hard to find. Men concerned with public works or with utility construction take no interest in the problems of housing or of factory building. Subcontractors are little inclined to acknowledge a working partnership with contractors. Producers of materials and equipment do not fully recognize their inter-relation with users and owners. Financial and realty men consider themselves as quite separate from the men who plan and build, and overlook the effect of construction on the earning power and stability of their investments. Construction employer and construction worker are largely blind to their joint responsibility to the public.

Thus each group looks at its own difficulties, forgetting that all depend for their livelihood on the same market and on proof that their work is of lasting benefit to the community.

* * *

Of the difficulties that beset construction it is scarcely necessary to recall the many internal problems—improvement of design and materials, reduction of wastes in financing and distribution, betterment of labor relations, elimination of obsolete or restrictive practices. These are well known. The external problems, arising from the relation of construction to the public, are less obtrusive.

Possible customers, especially in the housing field, are slow to buy in the face of what is claimed to be excessive cost; the industry has not convinced them that its product is maintained at highest quality and lowest cost and that stability of investment is assured. Funds for public works are voted grudgingly so long as people regard public improvements as luxuries and construction contracts as riots of waste; the economic value of improvements and of sound works planning and programming has not been clearly enough proved.

An unsound condition is revealed also by the not uncommon charge that many obsolete methods persist in construction work. And, coming to the critical problem of employment and relief, disorganization of construction by the competition of relief labor is likely to continue until the employment-creating and industry-stimulating effects of construction by free labor are fully brought home to the public consciousness.

In brief, imperfect appreciation of the values derived from construction lies at the root of many present-day troubles. If the example of other industries has meaning, the construction industry is under obligation to build up adequate customer recognition of the benefits that flow from its work. The need for better public relations is unmistakable.

* * *

When effectively organized, the interests engaged in construction are strong enough and able enough to make headway against present obstacles and handicaps. But only when so organized. It seems clear that the first step toward this objective is to recognize that they form a unit industry which must act in cooperation.

Roadbuilding Offers New Opportunities

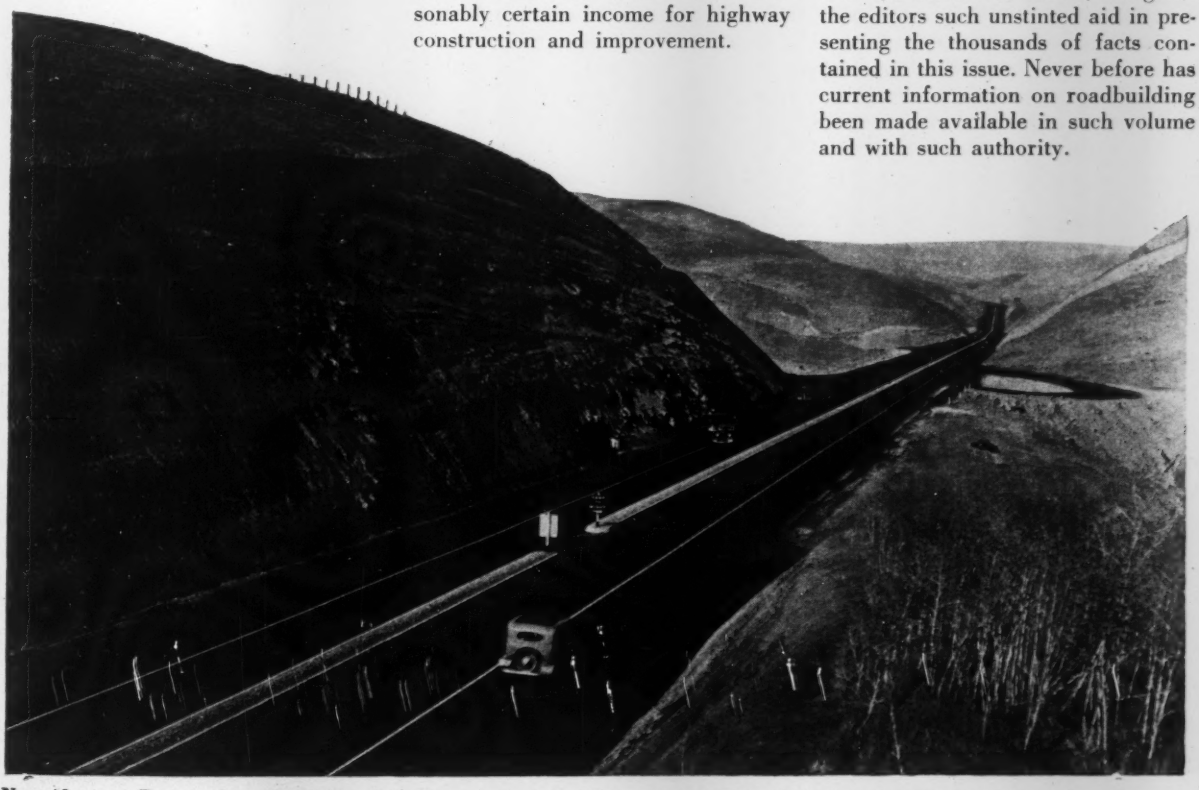
THIS ISSUE of *Engineering News-Record* is dedicated to roadbuilding as a market for engineering and industry, and as a producer of jobs and profits. No other public-works activity is calling in so many ways for the engineer's and contractor's service and the manufacturer's products. Bridges, buildings, tunnels, electric lighting and signaling, are to-day as much a part of the highway as are earthwork, drainage and roadway surfacing. All these activities make jobs for the construction industry, and they require every kind of construction material and machine to make these jobs profitable and economically justifiable.

And opportunity in the highway field is growing. This issue carries vital information of a new era in highways; an era of wider, straighter and more level roads; an era of superior quality in engineering design and planning, in construction skill and in the materials and machines used in construction. All these widen the opportunity for engineering service and for industry.

NATURAL questions are: What kinds of roads are being built? How much money is being spent for them? Will the rate of spending be continued? In the articles that follow the answers are given for the country as a whole; and again for each state individually. Because next week the eleven western states are to be host to the highway builders and general contractors of the nation, special emphasis is given to these states. All the statements and figures come from responsible state officials. In respect to expenditures for 1939, the specific values are budget estimates, but they are carefully considered estimates based on a reasonably certain income for highway construction and improvement.

But mileage and expenditures are not the only information and perhaps not the most important information that comes from reading these reports state by state. In each case the reader is given a prophetic insight into official thinking that points the way for engineers, construction men, and manufacturers to anticipate the needs of the roadbuilding market, needs which must be met by better methods, better materials and better construction equipment than roadbuilding has ever before demanded. In so far as equipment is concerned, some of it is already available as presented in the text that occupies a full forty of the following pages. That technical skill is developing to meet the demand is evident in another 30-page section of the issue.

AND NOW A WORD of our debt to the scores of highway officials and manufacturers who have given the editors such unstinted aid in presenting the thousands of facts contained in this issue. Never before has current information on roadbuilding been made available in such volume and with such authority.



New Altamont Pass road on the Oakland-Stockton route east of Livermore, Calif., widened and greatly straightened.

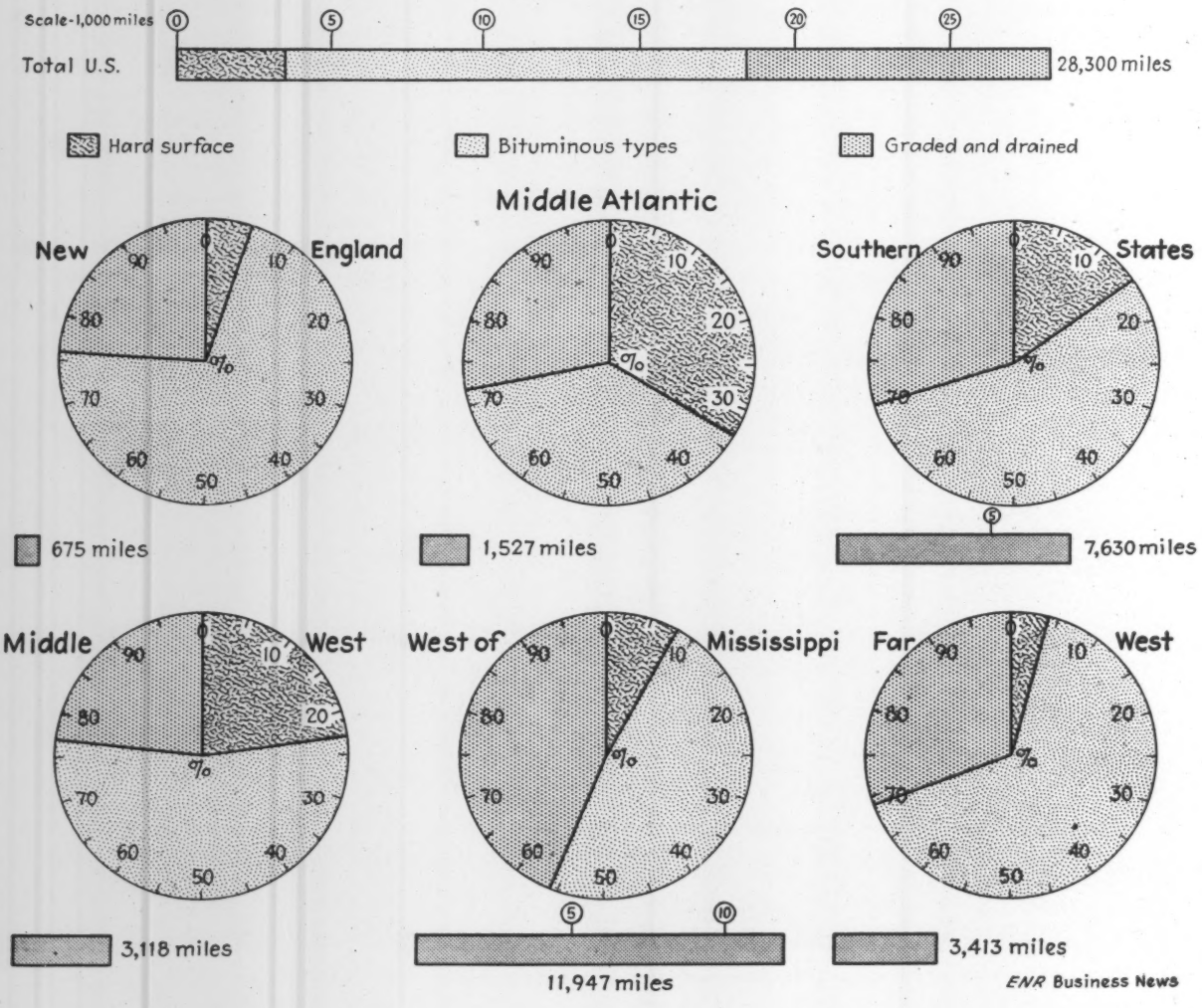
Roadbuilding Continues Active

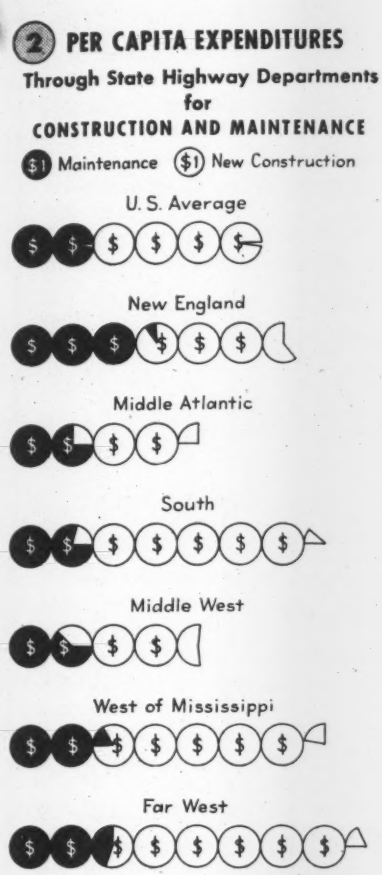
***Contents in Brief**—The 48 states in 1938 invested one-third of their highway money in maintenance and equipment, and two-thirds in new construction. With their construction money, $735,000,000, they improved 28,310 mi. of highway, of which 12.3 per cent is hard pavement, 52.7 per cent bituminous types of surfacing and 35 per cent is graded and drained and other untreated surfacing. Early budgets for 1939 reported by 40 states indicate, in spite of the cut in federal-aid funds, that 1939 construction will be within 2 per cent of the 1938 volume.*

INCREASING USE of bituminous types of surfacing and a larger proportion of highway money assigned to maintenance are the principal trends revealed by the year's state highway mileage and expenditure statistics reported to *Engineering News-Record* by 48 state highway departments.

In 1938, state highway departments built 28,310 mi. of improved highways, of which 3,495 mi., or 12.3 per cent, were constructed with hard pavement, 14,947 mi., or 52.7 per cent, with bituminous surfaces and 9,868 mi., or 35 per cent, were graded and drained or improved with untreated surfacing. Compared with estimated mileages constructed in 1937, this represents a drop of 4 per cent in total mileage improved, a drop of 3 per cent in hard surfacing, an increase of 65 per cent in bituminous types and a drop of 41 per cent in untreated surfacing, and graded and drained mileage.

1 STATE HIGHWAY CONSTRUCTION MILEAGE—1938





Practice varies in different sections of the country. The Middle Atlantic states put 33 per cent of their 1938 mileage into 500 mi. of hard surfacing; Middle West states, 23 per cent, or 715 mi.; Southern states, 15 per cent, or 1,134 mi.; Far West states, 4 per cent, or 152 mi.; New England, 5 per cent, or 34 mi.; and West of Mississippi states, 8 per cent, or 960 mi. of hard surfacing.

New England selected bituminous types of surfacing for 480 mi., or 71 per cent of its mileage; Far West, 2,204 mi., or 65 per cent; South, 4,215 mi., or 55 per cent; and Middle West, 1,676 mi., or 54 per cent, all above the national average. West of Mississippi states, with 5,768 mi., or 48 per cent, and Middle Atlantic states, with 604 mi., or 39 per cent, are below the average percentage of bituminous mileage.

1938 expenditures

Preliminary estimates of state highway expeditures for 1938 total $735,000,000 for construction and maintenance, broken down into $493,000,000 for construction and $242,000,000 for maintenance and equipment.

On this basis, each American in 1938 spent through his various state highway departments an average of $5.68, of which $1.97 was for maintenance and equipment and $4.01 for new highway improvements. Per capita expenditures in the West are higher than the national average as is to be expected. By regions they are: Far West, $8.18; West of Mississippi, $7.22; South, $7.11; New England, $6.61; Middle Atlantic, $4.25; and Middle West, $4.52.

The maintenance-new construction ratio varies in different parts of the country; thus New England maintenance is highest at $3.08 per capita. Far West second at $2.56, followed by West of Mississippi at $2.16, all above the national average; and by South, $1.81; Middle Atlantic, $1.74 and Middle West, $1.61, all below the national average.

Estimates indicate that in 1936 27 per cent of the combined construction and maintenance funds was assigned to maintenance; in 1937, 29 per cent, which climbed to 33 per cent in 1938. The distinction between reconstruction and maintenance is not always clear, and no doubt some reconstruction helps to account for this rapidly mounting maintenance-to-total ratio.

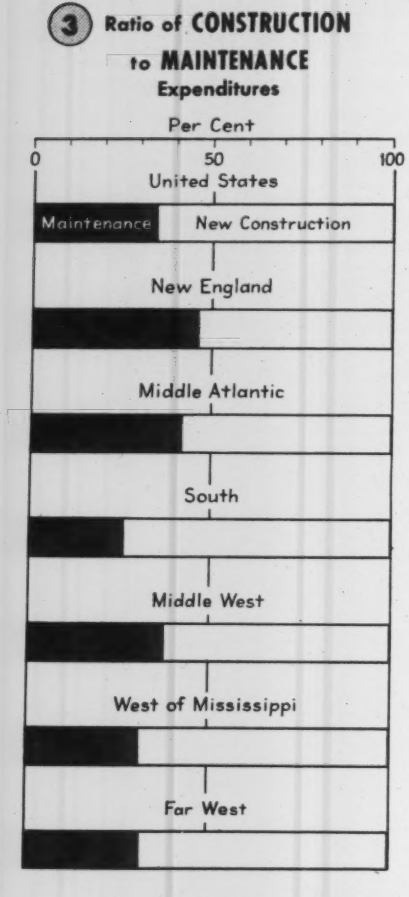
New England reports the highest maintenance ratio, 46 per cent; Middle Atlantic is next with 41 per cent; then Middle West with 36 per cent. Below the national average are Far West with 31 per cent; West of Mississippi with 30 per cent; and South with 25 per cent of 1938 combined construction-maintenance funds assigned to maintenance.

Of the new construction expenditure total, $493,000,000 in 1938, the South spent $135,000,000, or 27 per cent; West of Mississippi, $129,000,-

I—HIGHWAY CONSTRUCTION RECORDS FOR 48 STATES

States	Mileage Constructed in 1938				Expenditures — 1938 (,000 omitted)			Expenditure Budget — 1939 (,000 omitted)		
	Total	Hard Surface	Bituminous Types	Graded & Drained	Total Const. & Maint.	Construction	Maint. & Equipment	Total Const. & Maint.	Construction	Maint & Equipment
Me	343	11	203	129	$11,050	$6,856 [1]	$4,194 [2]	$9,940	$5,650 [1]	$4,290 [2]
N. H	112	3	103	6	5,450	1,875	3,575,	4,875	2,275	2,600
Vt	104	0.5	103	0.5	5,763	3,524	2,239	.....	.....	.....
Mass	27	0	20	7	15,517 [4]	5,074	10,443 [3]	.....	.....	.....
R. I	22	7	12	3	3,122	1,836	1,286	2,775	1,800	975
Conn	67	12	39	16	13,076	9,721	3,355	21,970	18,125	3,845
New Eng	**675**	**33 5**	**480**	**161 5**	**$53,978**	**$28,886**	**$25,092**	**$39,560**	**$27,850**	**$11,710**
N. Y	632	217	206	209	$36,525 [5]	$26,500	$10,025	$34,809	$24,309	$10,500
N. J	51	39 [6]	2 [6]	10 [6]	11,563	8,070	3,493	.....	.....	.....
Pa	545 [7]	143	319	83	60,631	28,263	32,368	.....	.....	.....
Md	90	39	20	31	9,881	6,904	2,977	9,364	5,887	3,477
Del	209	62 [8]	57	90	3,167	2,156	1,011	2,975	2,000	975
Mid Atl	**1,527**	**500**	**604**	**423**	**$121,767**	**$71,893**	**$49,874**	**$47,148**	**$32,196**	**$14,952**
Va	412	154	253	5	$25,116	$20,093 [9]	$5,023 [9]	$25,000	$18,655 [9]	$6,345 [9]
W. Va	1,215	14	1,096	105	17,100	10,400	6,700	17,100	10,400	6,700
N. C	502	117 [10]	278 [10]	107	23,033	8,685	14,348	23,100	9,000	14,100
S. C	811	96 [11]	627	88	13,758	10,949	2,809	12,950	10,000	2,950
Ga	569	48	193	328	21,206	19,180	2,026	18,700	17,000	1,700
Fla	408	37	163	208	10,669	7,653	3,016	15,610	12,141	3,469
Ala	925	1	911	13	12,485	10,200	2,285	13,350	11,150	2,200
Miss	775	330	23	422	21,539	19,739	1,800	23,699	22,099	1,600
La	269	102	10	157	6,361	5,711	650	15,989	10,739	5,250
Ky	1,246	167	331	748	20,303	15,120 [12]	5,183	13,500	8,000	5,500
Tenn	498	68	330	100	9,314	7,157	2,157	8,500	6,500	2,000
South	**7,630**	**1,134**	**4,215**	**2,281**	**$180,884**	**$134,887**	**$45,997**	**$187,498**	**$135,684**	**$51,814**
Ohio	470	129	299	42	$32,364	$17,293	$15,071	$30,500	$17,500	$13,000
Ind	891	197	636 [13]	58	15,687	10,589	5,098	15,775	11,275	4,500
Ill	759	194	171	394	27,418	20,820	6,598	30,100	23,000	7,100
Wis	638	89	339	210	20,700	14,500	6,200 [14]	18,900	12,900	6,000 [14]
Mich	360	106	231	23	18,068	10,499	7,569	20,600	13,500	7,100
Mid West	**3,118**	**715**	**1,676**	**727**	**$114,237**	**$73,701**	**$40,536**	**$115,875**	**$78,175**	**$37,700**
Minn	536	43	219	274	$23,486	$10,855	$12,631	$18,450	$11,450	$7,000
Ia	555	292	84	179	17,247	12,979	4,268	15,250	11,000	4,250
Mo	433	57	72	304	13,236	8,832 [4]	4,404	14,901	8,701 [4]	6,200
Ark	781	41	485	255	8,546	5,525	3,021	7,270	4,250	3,020
N. D	582	0	547	35	6,641	4,162	2,479	5,560	3,500	2,060
S. D	1,028	11	672	345	6,935	4,906	2,029	6,790	4,500	2,290
Neb	882	53	379	459	11,025	8,070	2,955	.....	.....	.....
Kan	1,479	40	1,089	350	13,259	7,937	5,322	12,176	6,951	5,225
Okla	497	93	218	186	12,413	9,472	2,941	8,825	6,250	2,575
Tex	2,951	330	962	1,659	37,888	28,985	8,903	38,384	30,000	8,384
Mont	231	0.3	44.3	186.3	4,571	2,477	2,094	7,750	5,650	2,100
Wyo	370	0	185	185	5,350	4,500	850	4,350	3,500	850
Colo	900	0	405	495	15,396	13,735	1,661	10,800	9,250	1,550
N. M	722	0	416	306	8,644	6,937	1,707	.....	.....	.....
W. of Miss	**11,947**	**960.3**	**5,768.3**	**5,218.3**	**$184,637**	**$129,372**	**$55,265**	**$150,506**	**$105,002**	**$45,504**
Ida	449	5	277	167	$7,059	$5,192	$1,867	.....	.....	.....
Utah	231	5	148	78	5,663	3,787	1,876	$5,130	$3,300	$1,830
Ariz	219	4	194	21	5,974	4,493	1,481	.....	.....	.....
Nev	328	0	255	73	4,738	3,849	889	4,020	3,170	850
Wash	948	24	606	318	11,870	8,502	3,368	10,056	6,456	3,600
Ore	700	27	348	325	8,755	5,132	3,623	9,653	5,993	3,660
Calif	538	87	376	75	35,084	23,446	11,638	27,500	18,400	9,100
Far West	**3,413**	**152**	**2,204**	**1,057**	**$79,143**	**$54,401**	**$24,742**	**$56,359**	**$37,319**	**$19,040**
U. S.	**28,310**	**3,494.8**	**14,947.3**	**9,867.8**	**$734,646**	**$493,140**	**$241,506**	**$596,946**	**$416,225**	**$180,720**

1. Includes bridges and grade crossings; 2. Includes bridges; 3. Includes flood; 4. Includes 100% federal grants; 5. Grading and drainage jobs practically all treated; 6. Includes widening: 20 hard surface; 2 bituminous; 8 graded and drained; 7. Contract jobs only; 8. Includes widening: 43; 9. Includes secondary roads; 10. Includes widening: 65 hard surface; 32 bituminous; 11. Includes widening: 75; 12. Includes rural highways; 13. Includes rock asphalt resurfacing, 280; surface treatment, 280; 14. Does not include equipment — contractor and county owned.



000 or 26 per cent; Middle West, $74,000,000, or 15 per cent; Middle Atlantic, $72,000,000, or 15 per cent, Far West, $54,000,000 or 11 per cent; and New England, $29,000,000 or 6 per cent.

The percentage of total maintenance expenditures for 1938 in each territory is, in order of volume: West of Mississippi, $55,000,000, or 23 per cent; Middle Atlantic, $50,000,000, or 21 per cent; South, $46,000,000, or 19 per cent; Middle West, $41,000,000 or 17 per cent; Far West, $25,000,000, or 11 per cent; and New England, $21,000,000 or 9 per cent.

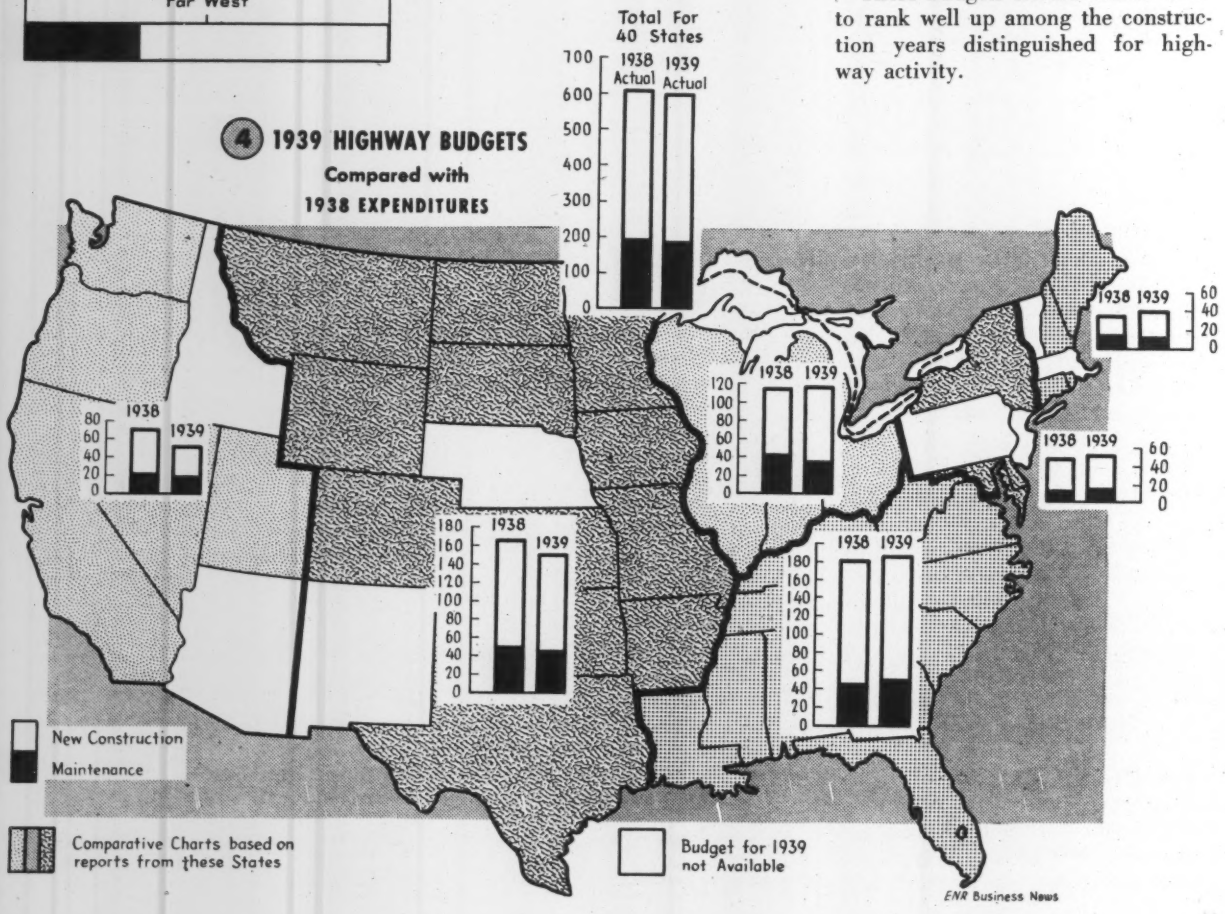
Prospects for 1939 are good

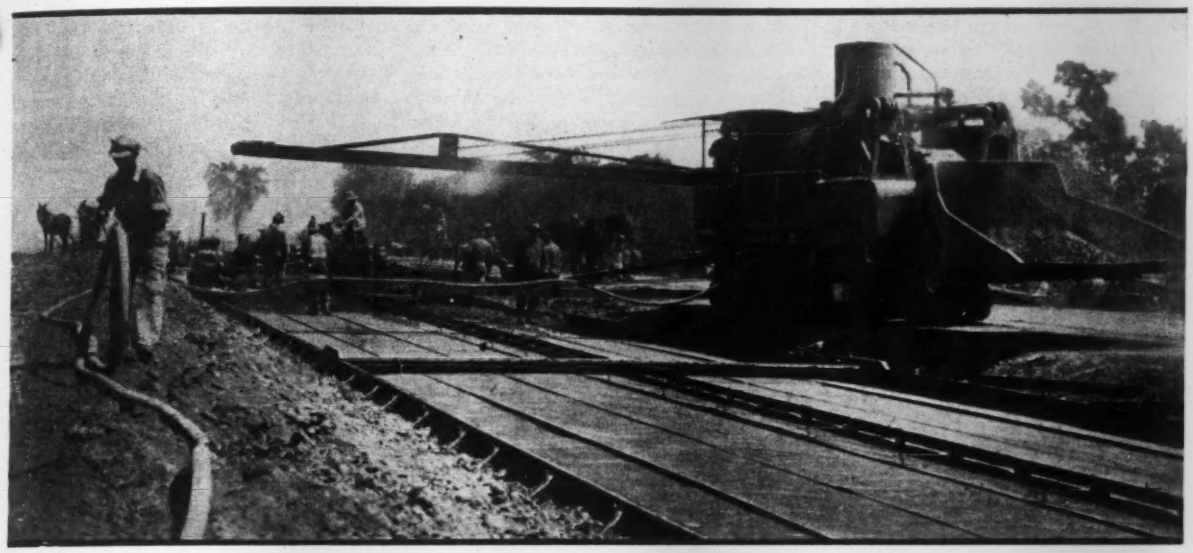
Despite the fact that this is a legislature year, forty states have been able to report their 1939 budgets, an exceptionally fine record in advance planning. The expenditures budgeted by the reporting states (Vermont, Massachusetts, New Jersey, Pennsylvania, Nebraska, New Mexico, Idaho and Arizona are missing) total $597,000,000, only 2 per cent below 1938 expenditures in spite of the curtailment in federal aid. Maintenance is budgeted to get $181,000,000, also a drop of 2 per cent from 1938.

The four New England states on record have budgeted a 21 per cent increase over 1938; South and Middle West, with all states represented, 4 per cent and 1 per cent increases respectively, while Middle Atlantic, West of Mississippi and Far West, each with two states missing, have budgeted decreases from 1938 of 5 per cent, 8½ per cent and 15 per cent respectively in their 1939 expenditures.

New construction budgets total $136,000,000 for the South, (all states represented); $105,000,000, West of Mississippi (Nebraska and New Mexico missing); $78,000,00 in Middle West (all states represented); $37,000,000 in the Far West (Idaho and Arizona missing); $32,000,000 in Middle Atlantic (Pennsylvania and New Jersey missing); and $28,000,000 in New England (Vermont and Massachusetts missing).

These budgets should enable 1939 to rank well up among the construction years distinguished for highway activity.





THE PAVER SERVING THIS FOUR-LANE HIGHWAY IN MISSOURI WORKED ON THE SEPARATING PARKWAY.

Road Plans and Expenditures

***Contents in Brief**—Roads built and money spent on highways in 1938 are given as reported by state highway engineers in all the states of the Union. Anticipated highway expenditures for 1939 are given for 40 of the 48 states. Also given for every state are brief official statements of trends in highway administration, design and construction. New demands on road engineering and on the manufacturers of roadbuilding material and equipment are clearly indicated.*

New England States

Rhode Island plans bypasses

JOHN V. KEILY, chief division of state roads and bridges, reports that the program of roadbuilding during last year and probably for the next year will be somewhat curtailed due to less funds. The main activities will be concerned with those projects which are financed with federal-aid and state funds, and the prosecution of routine maintenance work.

Attention is being particularly directed to the reconstruction of inadequate and obsolete sections of the main trunk lines and to the construction of bypass routes around the congested areas. Studies are being made for the rehabilitation and the development along modern protective lines of the areas devastated by the September hurricane of last year. These areas are mainly along the ocean and bay shore lines and will involve the construction of a system of secondary roads.

1938—ROAD IMPROVEMENT—1939
Rhode Island

Mileage constructed in 1938	18.74
Hard surface (concrete, brick, block)	6.87*
Bituminous types (including surface treated stabilized bases)	11.87**
Graded and drained (including gravel or other untreated mineral surfaces)	2.92***
Expenditures for 1938	
Construction	$1,836,263
Maintenance	1,229,346
Equipment (construction and maintenance)	57,387
Estimated expenditures for 1939	
Construction	$1,800,000
Maintenance	900,000
Equipment (construction and maintenance)	75,000

* Dual type pavement—reinforced concrete and bituminous macadam penetration.
** 10.18 bituminous macadam penetration and bituminous concrete; 1.69 mi. sheet asphalt pavement on concrete base.
*** The mileage covered by this stage construction project was paved with bituminous macadam penetration pavement and is included in the total for bituminous types.

Most of the main line projects are dual type, concrete and bituminous macadam construction at least four lanes wide with a center separation either raised or striped. Bridge work for the coming year will depend upon the funds available and range from $25,000 to $150,000 in cost.

Connecticut plans arterials

E. C. WELDON, deputy highway commissioner, states that during the past year the highway department has constructed several sections of dual-type pavement and has given considerable thought and study to the extension of such types of pavement across the state and toward the Massachusetts state line to facilitate through traffic between New York City and the centers of population to the north and east of the state. The department is planning a

1938—ROAD IMPROVEMENT—1939
Connecticut

Mileage constructed in 1937-38 fiscal year	67.35
Hard surface (concrete, brick, block)	12.29
Bituminous types (including surface treated stabilized bases)	38.84
Graded and drained (including gravel or other untreated mineral surfaces)	16.22
Expenditures for 1938	$19,278,919
Construction	9,721,010
Maintenance	2,953,870
Equipment (construction and maintenance)	401,683
Estimated expenditures for 1939	$27,000,000
Construction	18,125,000
Maintenance	3,425,000
Equipment (construction and maintenance)	420,000

long-time program in order that the proposed work may tie in with existing highways and at the same time serve larger centers of population within the state. This work has been made possible by an act of the 1937 legislature establishing the so-called Wilbur Cross Parkway to the Massachusetts state line. It is intended that this road will be of the dual type and serve both pleasure and commercial vehicles. This is in line with the general policy of the department to separate opposing lanes of traffic on the main trunk lines as necessity for reconstruction arises.

Massachusetts work active

BASED on the best unofficial information available as to highway work in Massachusetts, mileages and expenditures for 1938 are as follows:

1938—ROAD IMPROVEMENT—1939

Massachusetts

Mileage constructed in 1938	26.906
Hard surface (concrete, brick, block)	0.106
Bituminous types (including surface treated stabilized bases)	19.698
Graded and drained (including gravel or other untreated mineral surfaces)	7.102
Expenditures for 1938	
Construction	$20,808,658
Maintenance	6,372,300
Equipment (construction and maintenance)	811,007

To coordinate these mileages and expenditures the following breakdown of the construction total is given:

State construction	$3,833,422
Spec. legis. work	5,319,851*
Cooperative work	4,738,717**
Spec. work	2,416,474
Flood work	3,259,499
WPA work	1,240,695

* Includes $5,000,000 legislative grant to cities and towns for new construction.
** Includes $2,026,281 from cities and towns for rebuilding roads.

Vermont raises standards

H. E. SARGENT, state highway commissioner, states that during the past two years pavement widths on main lines have increased from 18 ft. to 20 ft., and the old 3-ft. shoulder is being replaced on new projects with one not less than 6 ft. wide. Increased sight distance is being used with an attempt to have the minimum sight along new highways not less than 600 ft. Ditches are being set back from the edge of the road to minimize the accident hazard and to heighten the sense of security of drivers. Heavier foundation courses better to insure a more permanent surface are being built. Shoulders are being bituminous-treated to improve their serviceability as well as the safety of the road. The use of flatter slopes on low embankments is being employed, thus eliminating the need of guardrail in many cases, while flatter slopes and rounding of the top of the cuts reduce maintenance costs by permitting the quicker growth of grasses and a reduction in slope erosion.

1938—ROAD IMPROVEMENT—1939

Vermont

Mileage constructed in 1938	104.1
Hard surface (concrete, brick, block)	0.6
Bituminous types (including surface treated stabilized bases)	102.9
Graded and drained (including gravel or other untreated mineral surfaces)	0.6
Expenditures for 1938 (supervision not incl.)	$5,762,633
Construction	3,523,505
Maintenance	2,160,710
Equipment (construction and maintenance)	78,419

New Hampshire stops diversion

D. H. DICKINSON, chief engineer, state highway department, states that trends during the past year have been toward low-cost roads built in accordance with stage construction methods rather than toward expensive types of pavements. Consideration has been given to line, grade, drainage and foundation stability generally with a road mix or treated gravel surface. These roads are adequate for present traffic requirements over a considerable portion of the state, their upkeep is not excessive and they are built to receive higher types of pavement according to necessity.

Although revenue from the sale of gasoline has never been used in New Hampshire for other purposes than highway work, a constitutional amendment was passed at the last general election safeguarding this fund from any hazard from future raids by those seeking easy money.

1938—ROAD IMPROVEMENT—1939

New Hampshire

Mileage constructed in 1938	112
Hard surface (concrete, brick, block)	3
Bituminous types (including surface treated stabilized bases)	103
Gravel untreated	6
Expenditures for 1938	$6,300,000
Construction	1,875,000
Maintenance	2,775,000
Flood	800,000
Operation	850,000
Estimated expenditures for 1939	5,625,000
Construction	2,275,000
Maintenance	2,600,000
Operation	750,000

Maine work scattered

LUCIUS D. BARROWS, chief engineer, state highway commission, reports that road activities in 1939 will not differ essentially from those of 1938 which included regular federal-aid road and grade-crossing improvement, secondary and town road improvement by state-aid law, and bridge construction under the general bridge act. One new activity was the maintenance of certain unimproved roads, for which the legislature made available the sum of $200,000. This work was provided for by the legislature in 1937 and was sponsored by the Maine State Rural Letter Carriers Association. The estimated work for 1938 and the present year are as follows:

1938—ROAD IMPROVEMENT—1939

Maine

Mileage constructed in 1938	343
Hard surface (concrete, brick, block)	11
Bituminous types (including surface treated stabilized bases)	203
Graded and drained (including gravel or other untreated mineral surfaces)	129
Expenditures for 1938	$9,391,937
Construction, highways	5,367,100
Maintenance	3,931,752
Equipment (construction and maintenance)	93,085
Bridge construction	1,145,716
Bridge maintenance	169,056
Grade crossings	343,080
Estimated expenditures for 1939	$8,590,000
Construction, highways	4,500,000
Maintenance	4,000,000
Equipment (construction and maintenance)	90,000
Bridge construction	800,000
Bridge maintenance	200,000

Middle Atlantic States

New York extends parkways

HIGHWAY DEPARTMENT OFFICIALS report that the state division of highways during 1938 constructed 632 mi. of highways, including all types of which 217 were concrete or other hard surface. Expenditures for 1938 for construction and reconstruction according to contracts awarded amounted to about $26,500,000. This total included federal-aid funds, both regular and emergency. As has been the case during the past several years, state appropriations made available for highway use were far below highway requirements when considered in the light of engineering studies, safety and traffic volume increase. In spite of limited appropriations and continued diversion of highway funds to other uses, the division of highways registered good progress during the past year. A notable accomplishment was the completion of a 9-mi. parkway link between the Northern State Parkway and Southern State Parkway on Long Island. These two parallel parkways are thus connected for the first time with a cross-country highway which also furnishes a most important through route from New York City to Jones Beach. The new connection completes a program which was undertaken early in 1937, and involved a cost of $4,139,000. During 1938 alone eight contracts on this link were awarded and completed at a cost of $2,723,000, stress being laid on early completion because of the traffic anticipated incident to the 1939 New York World's Fair.

1938—ROAD IMPROVEMENT—1939
New York

Mileage constructed in 1938	632
Hard surface (concrete, brick, block)	217
Bituminous types (including surface treated stabilized bases)	296
Graded and drained (including gravel or other untreated mineral surfaces	209*
* Grading and drainage jobs practically all treated.	
Expenditures for 1938	$36,525,000
Construction and reconstruction	26,500,000
Maintenance including equipment	10,025,000
Equipment (construction and maintenance) (Est.)	1,000,000
Estimated expenditures for 1939	$35,808,762
Construction and reconstruction	24,308,762
Maintenance, including equipment	10,500,000
Equipment (construction and maintenance)	1,000,000

Among highway accomplishments in the up-state area might be noted the completion during 1938 of a new high level relocation on Route 5 approaching the city of Little Falls. This route is a most important cross-trunk line on which traffic was long impeded due to several dangerous underpasses involving tortuous curves, narrow pavement and exceedingly limited bridge clearances as well as congested city traffic. The high-level relocation now completed is of immense benefit to the city as well as to through traffic. Maximum grade is now 5 per cent whereas it was 11 per cent. The relocation made possible elimination of three underpasses together with many curves and bottlenecks.

Pennsylvania eliminates hazards

P. M. TEBBS, construction engineer, state department of highways, states that elimination of grades and dangerous curves was the characteristic trend of construction in 1938.

1938—ROAD IMPROVEMENT—1939
Pennsylvania

Mileage constructed in 1938	545.31
Hard surface (concrete, brick, block)	143.26
Bituminous types (including surface treated stabilized bases)	318.96
Graded and drained (including gravel or other untreated mineral surfaces)	83.09
Expenditures for 1938	$81,589,567
Construction	20,263,047
Maintenance	32,367,613
Equipment (construction and maintenance)	20,704,983

Mileage of 1938 construction is on contract jobs only and can be compared with the figure of $20,263,047 paid contractors. Mileage constructed by department forces, at a cost of more than $8,000,000 is not available because these forces work on a fiscal year basis, June 1 to May 31. Thus, mileage figures cannot be compared with total construction costs. Equipment costs includes "other" construction, administrative engineering, right-of-way purchases, etc. The 1939 expenditures cannot be estimated in the absence of a budget for the fiscal year commencing June 1.

New Jersey emphasizes safety

C. F. BEDWELL, construction engineer, state highway department, calls attention to two rapidly developing improvements for safety. In 1938, an extensive program of overhead illumination and experimentation was undertaken at locations where there was a high proportion of night accidents. Furthermore, after considerable research, a special center island design was developed and used in the conversion of existing three- and four-lane highways to the divided type. The curbing around the island is of white concrete sloped and panelled in such a way as to reflect headlight rays back to the driver, accentuating its visibility, particularly in wet weather, and guiding the motorist in fogs at night.

White corrugated curbs on the darker-colored separating strip of a New Jersey road are one of the new means by which the car headlights pick out the roadway boundaries at night. New lanes were added on the outside of this highway and the separating strip is laid on the center lanes of the old road.

This type of center island curbing was installed on about 25 mi. of highway.

Experience has shown that it is safer and more expeditious to design main highways with multiple separated two-lane roadways flanked by shoulders on both sides between the pavement and the separating islands. New Jersey is now designing a major project for construction in 1939 which will provide two fast and two slow traffic lanes in each direction with the possibility of developing service roads on both sides, the fast and slow roadways to be separated by islands with regulated interchange between the various roadways and no cross traffic.

	New Pavements		Widening Existing Pavements	
Mileage constructed in 1938	21.4	24.3*	29.7	19.4*
Hard surface	19.5	5.5*	19.9	19.4*
Bituminous types	....	....	1.7	....
Graded and drained	1.9	18.8*	8.1	....

* To be completed in 1939.

As indicating the variety of expenditures in eastern states where road-building has a long history details given by Mr. Bedwell are presented in full as follows:

EXPENDITURES FOR 1938
New Jersey

Classification of expenditure	
Construction of St. H'way Sys.:	
Road contracts	$4,118,173
Bridge and grade cross. contracts	1,107,167
Purchase of right-of-way	1,926,622
Total state highway construction	$7,151,962
W.P.A. sponsor's share—state highway projects	2,217,538
Maintenance of state h'way, roads and bridges	2,790,649
State highway lighting and operation of bridges	880,299
Institutional roads and approaches	305,996
Maintenance of bridges over Delaware and Raritan Canal	6,324
Lafayette Boulevard	15,935
County Aid	6,662,311
Township Aid	3,064,701
Purchase of plant and equipment	390,512
Engineering and inspection (state highway)	1,169,586
Engineering and inspection (county and township aid)	258,204
Cost of right-of-way	244,234
Administration & laboratory	377,839
	$25,536,090
Federal Works Program funds, not included in above	$917,736
Grand total	$26,453,826

Delaware stresses betterments

W. W. MACK, state highway engineer, reports active work in improving existing facilities. This has been accomplished by the extension of the divided-highway system and the widening, improvement and reconstruction of existing highways which have become obsolete or inadequate. Low-cost roads have also been given attention. In construction, emphasis has been given to securing more uniform and more stable subgrades. In 1939 these trends will continue, with possibly greater emphasis on the resurfacing of the older pavements before their salvage value is further reduced.

1938—ROAD IMPROVEMENT—1939
Delaware

Mileage constructed in 1938	166*
Hard surface (concrete, brick, block)	19
Bituminous types (including surface treated stabilized bases)	57
Graded and drained (including gravel or other untreated mineral surfaces)	90

* In addition there was constructed 43 mi. of concrete widening of existing road.

Expenditures for 1938	$3,166,979
Construction	2,155,920
Maintenance	945,111
Equipment (construction and maintenance)	65,948
Estimated expenditures for 1939	$2,975,000
Construction	2,000,000
Maintenance	900,000
Equipment (construction and maintenance)	75,000

Maryland revamps

NATHAN L. SMITH, chief engineer, state roads commission, indicates two classes of work to be emphasized in 1939: first, revamping and modernizing the existing primary highway system which was completed about 1915 and is now found inadequate to carry the traffic of today; and second, the grading, stabilization and general improvement of rural roads in an endeavor to get the residents of the farming sections out of the mud. The figures for 1938 and 1939 are as follows:

1938—ROAD IMPROVEMENT—1939
Maryland

Mileage constructed in 1938	90*
Hard surface (concrete, brick, block)	39
Bituminous types (including surface treated stabilized bases)	20
Graded and drained (including gravel or other untreated mineral surfaces)	31

* 119 mi. are under construction.

Expenditures for 1938	$9,881,172
Construction	6,903,445
Maintenance	2,581,219*
Equipment (construction and maintenance)	396,508

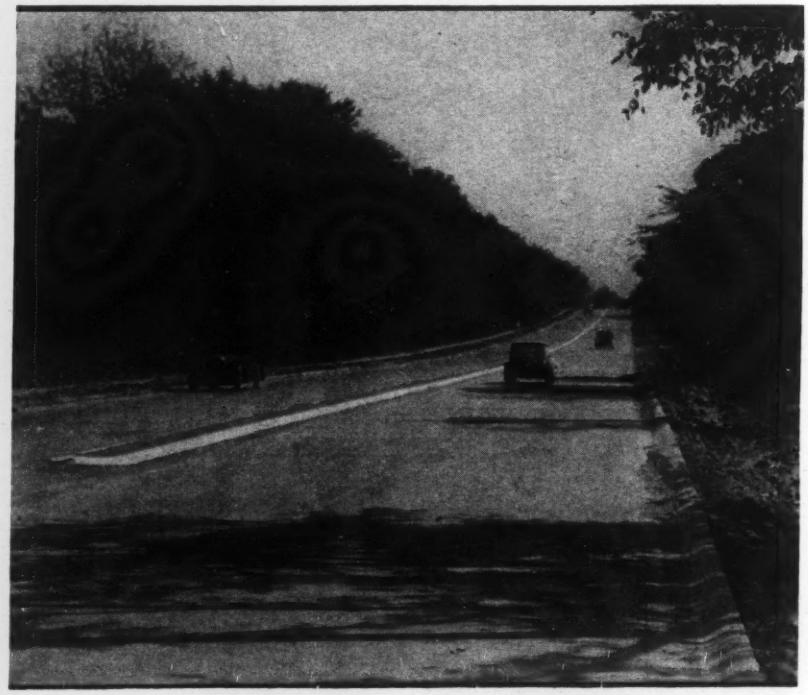
* County systems, $934,481; state system, $1,646,737.

Estimated expenditures for 1939	$9,363,864
Construction	5,886,700
Maintenance	3,255,164
Equipment (construction and maintenance)	222,000

Southern States

North Carolina holds steady

W. VANCE BAISE, state highway engineer, finds the last year a good one in construction and maintenance and looks for the current year to be as good. Last year the regular maintenance funds were supplemented by a $2,000,000 special appropriation allotted by the governor under authority



Lip curbs and a low rounded separating curb, often with white edges and colored concrete centers, as shown on this 1938 Indiana four-lane road, are common requirements of the modern highway.

Road drags, familiar since roadbuilders made them of logs, are still shaping earth roads, but now they are the lever-controlled, tractor-hauled machines of steel shown working on this West Virginia road.

of the 1937 act of the legislature from surplus highway funds, which materially helped out in the regular maintenance and betterment of the secondary highway system of about 48,000 mi. The program for 1939 will necessarily depend upon the action taken by the legislature but the governor has recommended that a $5,000,000 bond issue be approved to assist in a small way in standardizing trunk line state highways. The figures for last year and 1939 are as follows:

1938—ROAD IMPROVEMENT—1939
North Carolina

Mileage constructed in 1938	502.3
Hard surface (concrete, brick, block)	116.8*
Bituminous types (including surface treated stabilized bases)	278.3**
Graded and drained (including gravel or other untreated mineral surfaces)	107.2
Expenditures for 1938	$23,032,661
Construction	8,684,691
Maintenance	13,743,147
Equipment (maintenance)	604,823
Estimates expenditures for 1939	23,100,000
Construction	9,000,000
Maintenance	13,500,000
Equipment (maintenance)	600,000

* Includes 64.7 mi. widening.
** Includes 31.6 mi. widening.

South Carolina keeps steady pace

J. S. Williamson, state highway engineer, says that South Carolina's experience in building highways is that it is not economically sound to build short sections of costly highway with available funds when such roads are not needed in the immediate future. It is impossible to forecast what traffic conditions will be twenty or thirty years hence with sufficient accuracy to warrant such work. The practice has been and still is to build a more extensive mileage of roads designed to meet traffic conditions today and for a reasonable time in the future with provisions for widening and improvements as conditions may warrant. During the past year the department has been very successful in carrying along the construction program at a progressive but safe speed.

1938—ROAD IMPROVEMENT—1939
South Carolina

Mileage constructed in 1938	811*
Hard surface (concrete, brick, block)	21.2
Bituminous types (including surface treated stabilizing bases)	627
Graded and drained (including gravel or other untreated mineral surfaces	88
* Includes 75 mi. of widening.	
Expenditures for 1938	
Construction	$10,948,439
Maintenance	2,389,879
Equipment (construction and maintenance)	419,656
Estimated expenditures for 1939	
Construction	$10,000,000
Maintenance	2,650,000
Equipment (construction and maintenance)	300,000

Georgia improves secondaries

W. B. Brantley, state highway engineer, reports Georgia's most characteristic highway trend for the past and present year to be side-road development, directly to benefit rural areas, so that the mails can go to every section, school buses reach school houses and doctors visit their patients. While interest has not slacked in the main highways that run like ribbons from the Blue Ridge Mountains to the Atlantic Ocean, yet the principal goal throughout the state, is cutting through Georgia's red hills, sloping and flattening banks, sodding shoulders and building ditch checks. Local products, such as clay, sand and pebbles are being utilized to a great extent in the construction of these secondary roads.

A new four-lane concrete road, with a 4-ft. raised safety lane in the center, will be finished in a few months from Atlanta to Marietta, Ga. a distance of 35 mi.

1938—ROAD IMPROVEMENT—1939
Georgia

Mileage contracted in 1938	569
Hard surface (concrete, brick, block)	48
Bituminous types (including surface treated stabilized bases)	193
Graded and drained (including gravel or other untreated mineral surfaces	328
Expenditures for 1938	$25,667,323
Construction	19,180,183
Maintenance	1,693,728
Equipment (construction and maintenance)	332,223
Estimated expenditures for 1939	18,700,000
Maintenance	1,700,000
Construction	17,000,000
Equipment (construction and maintenance)	no figures

Tennessee steps up design

E. M. Turner, state highway engineer, states that 1938 marked the first significant step taken by the Tennessee department of highways toward seriously considering safety as a major element of road design. The building of a median strip between the two 22-ft. concrete halves of the four-lane Kingston Pike out of Knoxville and also on a short section of the Chattanooga road east of Murfreesboro represent the first work in thus falling into line with the most modern practice in four-lane highway construction. On two-lane construction, 11-ft. lanes were adopted on three new roads.

Secondary roads are proving a problem in the way of securing economic design. Restrictions on expenditure necessitate many small operations scattered over a large territory. The cost of organizing engineering parties, working up plans and specifications and awarding contracts for many operations of comparatively insignificant size is making supervision costly.

In general the work of 1938 and that planned for 1939 consists chiefly of improving alignment and surface of existing roads and elimination of grade crossings.

1938—ROAD IMPROVEMENT—1939

Tennessee

Mileage constructed in 1938	498
Hard surface (concrete, brick, block)	68
Bituminous types (including surface treated stabilized bases)	330
Graded and drained (including gravel or other untreated mineral surfaces)	100
51 bridges and 12 grade separations.	
Expenditures for 1938	$11,612,349
Construction	7,157,343
Maintenance	2,156,504
Equipment (construction and maintenance)	1,575,355
Other expenses—admin., etc.	723,146
Estimated expenditures for 1939	$10,000,000
Construction	6,500,000
Maintenance	2,000,000
Equipment (construction and maintenance)	1,500,000

Virginia betters surfaces

C. S. MULLEN, chief engineer, state department of highways, points out two trends that are developing in Virginia roadbuilding. The first is the widening of existing road surfaces more adequately to serve increasing traffic which was given a prominent place on the 1938 program, and included a considerable mileage of three-lane roads widened to four lanes, and two lanes to three lanes. The other outstanding feature of the 1938 work has been the resurfacing of a large mileage of bituminous and old concrete roads with a bituminous plant-mix top, which has resulted in stronger, more non-skid and smoother riding surfaces, and has received very favorable comment from the public.

1938—ROAD IMPROVEMENT—1939

Virginia

Primary System	
Mileage constructed in 1938	412
Hard surface (concrete, brick, block)	154
Bituminous types (including surface treated stabilized bases)	253
Graded and drained (including gravel or other untreated mineral surfaces)	5
Expenditures for 1938	
Construction	$16,795,968
Maintenance	2,226,869
Equipment (construction and maintenance)	Inc. above
Estimated expenditures for 1939	
Construction	$15,000,000
Maintenance	2,500,000
Equipment (construction and maintenance)	Inc. above
Secondary System	
Expenditures for 1938	
Construction	$3,297,724
Maintenance	2,796,017
Equipment (construction and maintenance)	Inc. above
Estimated expenditures for 1939	
Construction	$3,654,570
Maintenance	3,845,430
Equipment (construction and maintenance)	Inc. above

West Virginia speeds secondaries

BURR H. SIMPSON, highway commissioner, emphasizes construction of feeder roads in 1939 operations. The high points of the past year's operations have been: (1) A distinct separation made between the construction and maintenance divisions, each of which, through its division head is responsible and reports directly to the road commissioner; (2) With more than 90 per cent of the primary road system now paved, the road commissioner is giving increased attention to the reconstruction, along modern lines, of the more heavily traveled main-traffic arteries. A greatly expanded program of construction on secondary or feeder roads was begun in 1938, and this system will be focal point of work in 1939. The coming construction season will see a number of low-cost surfacing projects on the secondary system. The construction and maintenance figures for 1938 and 1939 are as follows:

Road fills across swamps are now made solid by blasting out the underlying mud, as shown on this Rhode Island road, so that the fill will settle to hard bottom.

1938—ROAD IMPROVEMENT—1939

West Virginia

Mileage constructed in 1938	1,215
Hard surface (concrete, brick, block)	14
Bituminous types (including surface treated stabilized bases)	1,096
Graded and drained (including gravel or other untreated mineral surfaces)	105
Expenditures for 1938	$17,100,000
Construction	10,400,000
Maintenance	5,900,000
Equipment (construction and maintenance)	800,000
Estimated expenditures for 1929	Same as for 1938
Construction	Same as for 1938
Maintenance	Same as for 1938
Equipment (construction and maintenance)	Same as for 1938

Supplementary Breakdown

Type of Work	Miles
Grade and drain	26
Base	43
Grade, drain and base	36
Mulch surface	217
Grade, drain and mulch surface	29
Bituminous surfacing	649
Base and bituminous surfacing	128
Grade, drain, base, and bituminous surfacing	73
Portland cement concrete	2
Grade, drain and concrete	12
Total	1,215

Kentucky modernizes

T. H. CUTLER, state highway engineer, announces an active revamping program in progress. From the data secured by the highway planning survey, certain facts are obvious regarding needs of highway construction. In the central part of the state the great need is for modernization. In the eastern and western parts of the state there were very few roads of any consequence prior to the advent of the automobile, and the program is one of building and not revamping. Most of the heavily traveled through routes are through the center of the state. The main objective is their modernization.

It is the purpose to construct four-lane divided highways where possible, adjacent to the metropolitan centers, and endeavor to complete a few modern high-type roads to connect with through routes in other states. As indicated in the statistics, 11 mi. of divided four-lane highways were built in

1938, and the program for 1939 will be a continuation of this type of construction in the vicinity of the larger population centers.

1938—ROAD IMPROVEMENT—1939
Kentucky

Mileage constructed in 1938	1,353
Hard surface (concrete, brick, block)	167*
Bituminous types (including surface treated stabilized bases)	331
Graded and drained (including gravel or other untreated mineral surfaces)	748

* Includes 11 miles divided lane.

Expenditures for 1938	$17,901,171**
Construction	12,718,136
Maintenance	4,713,623
Equipment (maintenance)	469,412

** Does not include $2,402,000 expended in 1938 for constructing rural highways.

Estimated expenditures for 1939	$13,500,000
Construction	8,000,000
Maintenance	5,000,000
Equipment (maintenance)	500,000

Louisiana expands secondaries

J. A. KINKEAD, office engineer, state highway commission, reports large figures for both 1938 and 1939 construction. With the exception of a few unpaved sections which are rapidly being eliminated, the primary network of the state highways is now surfaced. Thus, funds available during the year have, to a large extent, been used for much-needed betterments such as revision of alignment, grade reduction, increased capacity, elimination of hazards and improved surfacing. Hardly of less importance is the expansion of the secondary network of aggregate-surfaced highways, generally known as farm-to-market roads. During the year 425 mi. at a contract cost of $3,300,000 were under construction, of which 136 mi. had been opened to the public by the beginning of 1939. The outstanding bridge project of the year is the $9,500,000 combined highway and railway structure spanning the Mississippi River at Baton Rouge. Grading and steel work on the approaches are practically complete; the deep foundation work is proceeding satisfactorily and erection of steel for the main spans is expected to begin early in 1939.

1938—ROAD IMPROVEMENT—1939
Louisiana

Mileage constructed in 1938	269*
Hard surface (concrete, brick, block)	92
Bituminous types (including surface treated stabilized bases)	10
Graded and drained (including gravel or other untreated mineral surfaces)	156

* Includes 6 mi. of bridges and 4 mi. of grade separation.

Expenditures for 1938	
Construction	$6,361,000*

* Includes bridges, grade separations, maintenance construction.

Estimated expenditures for 1939	$15,989,000
Construction	10,739,000
Maintenance	5,000,000*
Equipment (construction and maintenance)	250,000

* Includes $1,500,000 extraordinary maintenance.

Supplementary Breakdown
(1938 Construction)

	Forward to 1939 Miles	Forward to 1939 Cost	New Work 1939 Miles	New Work 1939 Cost
Conc.	72	$3,192,000	116	$4,870,000
S.T.	24	350,000	..	.....
Gravel	281	2,444,000	400	3,050,000
Grading	78	1,744,000	51	912,500
Brs. (11)	3	9,893,000	5	1,128,000
Gd. Sept.	3	666,000	3	678,000
Rdsd. Imp.	7	64,000	8	100,000
Total	468	18,353,000	583	$10,738,500
Maint. Const.		610,000		
Total		$18,963,000		

Alabama improves seal coat

W. G. PRUETT, office engineer, state highway department, states that the major trend in highway improvement in the past four years in Alabama has been towards low-cost bituminous surfaces (costing about $2,600 per mile, not including base material) commensurate with the volume of traffic and away from rigid, high-cost-surface types.

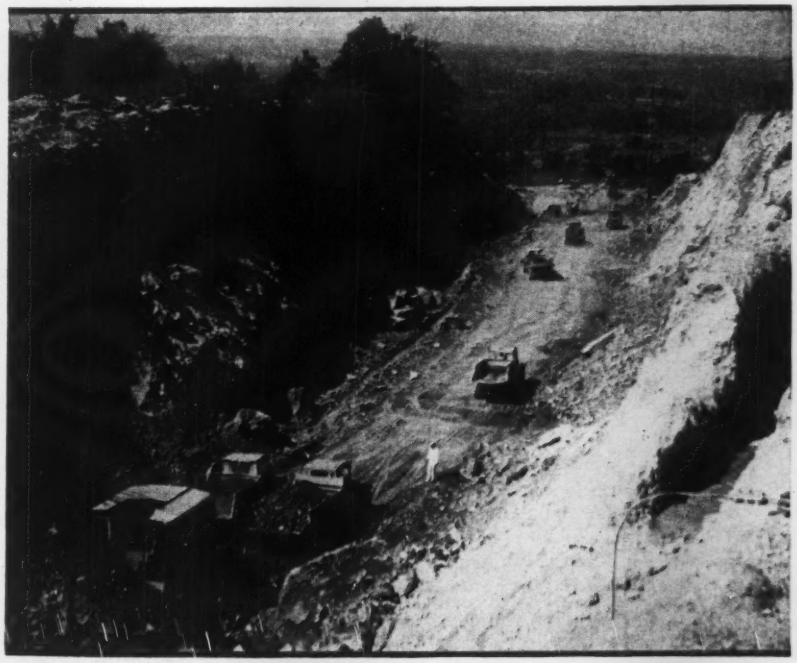
A minor trend which developed in 1938 and which appears to be significant has been improvement in the technique of preparing and placing seal coats. In Alabama during 1938 plant-mixed seal coats became standard practice. Plant-mixed seals have many advantages over the old style drag seal; a denser seal is obtained. Seal-coat practice also tends to require spreading by mechanical spreading and screeding equipment. As 1939 programs come up, it appears that both the major and minor trends above described will continue to be most significant in Alabama.

1938—ROAD IMPROVEMENT—1939
Alabama

Mileage constructed in 1938	92.5
Hard surface (concrete, brick, block)	1.3
Bituminous types (including surface treated stabilized bases)	911.0
Graded and drained (including gravel or other untreated mineral surfaces)	12.6
Expenditures for 1938	
Construction	$10,200,000
Maintenance	2,000,000
Equipment (construction and maintenance)	285,000
Estimated expenditures for 1939	
Construction	$11,150,000
Maintenance	2,000,000
Equipment (construction and maintenance)	200,000

Mississippi continues program

R. A. HARRIS, chief engineer, state highway department, states that construction of the new state highway system has kept the department busy in 1938 and will keep it busy in 1939 and perhaps longer. In 1936 the state initiated a $42,000,000 road program.



Heavy excavation as shown by this 70-ft. deep cut in Ohio is common-place in modern road work when better grades and alignment can be so obtained.

This work is 98 per cent complete. The legislature in 1938 provided an additional $40,000,000 to complete the original program and for the improvement of other state highways not embraced in the original program. The department is now busily engaged on this program; has secured a $3,000,000 PWA grant, and with the regular 1938, 1939, 1940 and possibly 1941 federal aid allotments, it has prospects of continuing the program well past the approaching construction season. The work and expenditures for 1938 and 1939 have been as follows:

1938—ROAD IMPROVEMENT—1939

Mississippi

Mileage constructed in 1938	775
Hard surface (concrete, brick, block)	324
Bituminous types (including surface treated stabilized bases)	23
Graded and drained (including gravel or other untreated mineral surfaces)	422
Bridges	6
Expenditures for 1938	$21,538,578
Construction	19,738,578
Maintenance	1,700,000
Equipment (construction and maintenance)	100,000
Estimated expenditures for 1939 and 1940	$47,397,279
Construction	44,197,279
Maintenance	3,000,000
Equipment (construction and maintenance)	200,000

Florida widens roadways

J. H. Dowling, state highway engineer, defines the characteristic trend of highway construction as being toward the two-lane roadway, using two 11-ft. lanes with a separating strip varying from 4 to 6 ft. in width. This separating lane is a regular section of the roadway but is painted black to mark the separation. Another trend has been toward having gentle front slopes, shallow ditches and gentle back slopes—this being accomplished by acquiring 200-ft. right-of-way and changing front slopes from 1 on 2 and 1 on 4 to 1 on 6 or even flatter.

1938—ROAD IMPROVEMENT—1939

Florida

Mileage constructed in 1938	408
Hard surface (concrete, brick, block)	37
Bituminous types (including surface treated stabilized bases)	163
Graded and drained (including gravel or other untreated mineral surfaces)	208
Expenditures for 1938	$10,668,617
Construction	7,652,809
Maintenance	3,015,808
Equipment (construction and maintenance)	901,252
Estimated expenditures for 1939	$15,609,897
Construction	12,141,150
Maintenance	3,468,747
Equipment (construction and maintenance)	900,000

Middle Western States

Ohio stresses subgrades

H. G. Sours, chief engineer, state department of highways, reports that during the past year subgrade and embankments were given a more prominent place in highway construction. The department refined its specification for placing embankment by dividing embankment material into (1) satisfactory soil, (2) granular material, (3) shale, (4) rock and (5) random material. Each kind of material is defined and the manner of placing each kind of material into embankment is prescribed. Provision is made to place satisfactory soil under two conditions, namely; (1) in fills 10 ft. or less in height, not subject to extensive floods, and (2) in fills which exceed 10 ft. in height or which are subject to long periods of flooding.

During the past year soil profiles were made in connection with the larger projects and the information thus obtained was the basis of embankment design and the basis of slope determination in cuts.

Supplementing the 1938 figures of expenditures given below, the Ohio state highway department completed contracts for the surface treatment of 1,460 mi. of roads; 12 mi. of separate roadside improvement contracts; 20 bridge or structure contracts involving $452,840; grade separations amounting to $1,137,764, and miscellaneous contract work such as piling, furnishing material, etc., amounting to $64,454.

1938—ROAD IMPROVEMENT—1939

Ohio

Mileage construction in 1938	470
Hard surface (concrete, brick, block)	129
Bituminous types (including surface treated stabilized bases)	299
Graded and drained (including gravel or other untreated mineral surfaces)	42
Expenditures for 1938	$32,364,155
Construction	17,293,490
Maintenance	14,282,003
Equipment (construction and maintenance)	788,752
Estimated expenditures for 1939	30,500,000
Construction	17,500,000
Maintenance	13,000,000
Equipment (construction and maintenance)	No report

Michigan stops diversion

Murray D. Van Wagoner, highway commissioner, considers the outstanding development in the administration of the Michigan state highway system during the past year to be the adoption of a constitutional amendment prohibiting the diversion of highway revenues. Despite serious organized opposition, the amendment was adopted at the November election by a majority of more than 283,000 votes. A report on campaign methods employed in Michigan is now being prepared and will be available to the 41 states without a similar constitutional guarantee in behalf of their motorists. The statistics of highway work in 1938 and as estimated for 1939 are as follows:

1938—ROAD IMPROVEMENT—1939

Michigan

Mileage constructed in 1938	360
Hard surface (concrete, brick, block)	106
Bituminous types (including surface treated stabilized bases)	231
Graded and drained (including gravel or other untreated mineral surfaces)	23
Expenditures for 1938	$18,067,575
Construction	10,499,477
Maintenance (including traffic service and betterments	7,394,720
Equipment (construction and maintenance)	174,026
Estimated expenditures for 1939	$20,600,000
Construction	13,500,000
Maintenance (including traffic service and betterments)	6,900,000
Equipment (construction and maintenance)	200,000

Indiana adds to dual roads

M. R. Keefe, chief engineer, state highway commission, stresses the addition to Indiana's mileage of dual highways and continued modernization of

1938—ROAD IMPROVEMENT—1939

Indiana

Mileage constructed in 1938	331
Hard surface (concrete, brick, block)	197
Bituminous types (including surface treated stabilized bases)	76
Graded and drained (including gravel or other untreated mineral surfaces)	58
Above does not include 280 mi. of rock-asphalt resurfacing or 280 mi. of surface treatment.	
Expenditure for 1938	$21,125,731
Construction	10,588,722
Maintenance	5,098,079
Estimated expenditures for 1939 (available)	$21,949,000
Construction	11,275,000
Maintenance	4,500,000

the system. The addition to the state system, of nearly 400 mi. of city streets which carry state-highway traffic through cities and towns of over 3,500 population, brought new maintenance and traffic-control problems. During the year, aside from the regular construction program, nearly 300 mi. of highways were salvaged by resurfacing and improvement of alignment, utilizing the worn pavement as a base. Two major policies have been in effect: the expenditure of highway funds as far as practicable on highways where improvement is justified by earnings and traffic condition, and the salvaging wherever possible of previous investments in roads.

Illinois enters rebuilding era

Ernst Lieberman, chief engineer, division of highways, considers the most important roadbuilding development of the year, both from the standpoint of predominance in the year's construction activity and as indicative of a future trend, was the modernization of present primary roads. Contracts awarded

during the year for this type of work totaled $5,655,000 and included projects such as relocations and alignment corrections, pavement widening, reconstruction of deteriorated pavements and reconstruction or widening of weak or narrow bridges and grade separations.

Illinois now has a considerably greater mileage of primary roads improved with high-type pavement than any other state. While there is need for a few extensions to this system, these will be limited to a relatively small mileage. The state has already entered the second cycle of its primary road development—that of reconstructing the present system. A considerable portion of the 1939 construction funds will be expended for replacing worn-out or obsolete pavements, and it is expected that in the future primary-road construction will be limited almost entirely to that class of work.

Road expenditures for 1938 and estimates for 1939 are as follows:

1938—ROAD IMPROVEMENT—1939

Illinois

Mileage constructed in 1938	759
Hard surface (concrete, brick, block)	194
Bituminous types (including surface treated stabilized bases)	171
Graded and drained (including gravel or other untreated mineral surfaces)	
Gravel	263
Earth	131
Expenditures for 1938	
Construction	$20,819,727
Maintenance	6,001,531
Equipment (construction and maintenance)	596,240
Estimated expenditures for 1939	
Construction	$23,000,000
Maintenance	6,500,000
Equipment (construction and maintenance)	600,000

Wisconsin improves roadbeds

E. L. Boettiger, state highway engineer, reports that current construction work in Wisconsin is characterized by the relatively small amount of hard-surface pavement placed. Construction programs have involved work in generally rugged terrain and the need of basic improvement of the roadbed with high standards for width, alignment and grade at relatively high cost has resulted in stage construction with low-cost surfacing courses. In hard-surface pavements, an increasing proportion of the work is in reconstruction and replacement of existing pavements that are old and obsolete. These old pavements, some of the first to be placed in this state, in areas of relatively high traffic, have a reasonably satisfactory structural condition but the standards of width, alignment and grade are such as to warrant replacement.

1938—ROAD IMPROVEMENT—1939

Wisconsin

Mileage constructed in 1938	638
Hard surface (concrete, brick, block)	89
Bituminous types (including surface treated stabilized bases)	339
Graded and drained (including gravel or other untreated mineral surfaces)	210
Expenditures for 1938	$20,700,000
Construction	14,500,000
Maintenance	6,200,000
Equipment (construction and maintenance)	none *
Estimated expenditures for 1939	18,900,000
Construction	12,900,000
Maintenance	6,000,000
Equipment (construction and maintenance)	none *

* Contractor and county owned.

States West of Mississippi

Minnesota studies high joints

J. T. Ellison, chief engineer, state department of highways, reports a very considerable amount of work done looking toward the elimination of high joints during freezing weather. The single outstanding accomplishment of the past year was the conversion of about 12 mi. of single-lane 18-ft. concrete pavement to a divided roadway. Each roadway has a surfaced width of 24 ft. of bituminous pavement with a space of 50 ft. or more between the two roadways. No attempt was made to carry identical grades on the two roadways, nor was the center island boulevarded. Flat slopes were carried, both on the outside and toward the center, to a shallow ditch on each side of the individual roadway. This takes care of a situation which has constituted a bottleneck and an extreme traffic hazard for the last several years.

1938—ROAD IMPROVEMENT—1939

Minnesota

Mileage constructed in 1938	536
Hard surface (concrete, brick, block)	43
Bituminous types (including surface treated stabilized bases)	219
Graded and drained (including gravel or other untreated mineral surfaces)	274
Expenditures for 1938	$23,111,000
Construction	11,639,000
Maintenance	11,432,000
Estimated expenditures for 1939	$18,430,000
Construction	12,430,000
Maintenance	6,000,000

North Dakota abandons gravel

Z. E. Sevison, state highway engineer, announces a distinct turn to bituminous construction. At the beginning of 1937 the policy of the highway department was changed to discontinue entirely the construction of gravel-surfaced roads. There were 5,213 mi. of gravel surface and only 850 mi. of hard surface at the beginning of the year 1938, and as a result of the change in policy 547 mi. of bituminous surface were completed during the year. The standard cross section was also

Louisiana's airline highway between Baton Rouge and New Orleans is a six-lane road with a 6-ft. neutral ground having a low curb.

1938—ROAD IMPROVEMENT—1939
North Dakota

Mileage construction in 1938	582
Hard surface (concrete, brick, block)	0
Bituminous types (including surface treated stabilized bases)	547
Graded and drained (including gravel or other untreated mineral surfaces)	35
Expenditures for 1938	$6,640,833
Construction	4,162,000
Maintenance	2,146,833
Equipment (construction and maintenance)	332,000
Estimated expenditures for 1939	5,569,000
Construction	3,500,000
Maintenance	2,030,000
Equipment (construction and maintenance)	30,000

revised to take into account the snow removal problem; a cross section was adopted as standard which incorporates the more recent design features of flat slopes, wide ditches and particularly an elevated grade and wide cuts with flat backslopes. The standard right of way width is now 200 ft. construction or reconstruction.

South Dakota speeds stabilization

THOR SOLEGLAD, assistant highway engineer, state highway commission, announces a fast-increasing mileage of bituminous type roads, including stabilized bases, and of roads being graded and drained for future surfacing. The figures follow:

1938—ROAD IMPROVEMENT—1939
South Dakota

Mileage constructed in 1938	1,028
Hard surface (concrete, brick, block)	11
Bituminous types (including surface treated stabilized bases)	672
Graded and drained (including gravel or other untreated mineral surfaces)	345
Expenditures for 1938	$6,935,478
Construction	*4,905,915
Maintenance	2,029,563
Estimated expenditures for 1939	$6,790,000
Construction	4,500,000
Maintenance	2,290,000

* Contract estimates and force account work does not include plans and survey or construction engineering.

Kansas contracts maintenance

A. B. NUSS, state highway engineer, is experimenting with maintenance by contract. During 1938 all maintenance except routine maintenance was contracted, and during 1939 several sections of routine maintenance will also be contracted for experimental purposes.

1938—ROAD IMPROVEMENT—1939
Kansas

Mileage constructed in 1938	1,479
Hard surface (concrete, brick, block)	40
Bituminous types (including surface treated stabilized bases)	1,089
Graded and drained (including gravel or other untreated mineral surfaces)	350
Expenditures for 1938	$13,259,531
Construction	7,937,345
Maintenance	3,773,858
Equipment (construction and maintenance)	1,548,328
Estimated expenditures for 1939	$12,176,026
Construction	6,951,026
Maintenance	4,110,000
Equipment (construction and maintenance)	1,115,000

During 1938 Kansas adopted the policy of using available local materials for constructing heavy base under bituminous surfaces with base and bituminous surface running the full width of the road from shoulder to shoulder, feeling that increased driving speed requires wider traffic lanes. Soil surveys are now made in the field when the preliminary survey is made and a soils profile is included in the plans indicating the type of soil and also containing a geologist's report as to where seepage difficulties may be expected due to underground geological conditions. All earth embankment is placed in the fill and thoroughly compacted at optimum moisture content.

Nebraska stabilizes dune sand

A. T. LOBDELL, chief, state bureau of roads, reports active progress in bituminous mix and graded and drained construction. About one-fourth of the state is sandhill territory in which the soil is dune sand some 85 per cent of which passes a 50 sieve. Active experimenting extending over several years has developed mixtures with medium- and slow-curing oils that are proving successful. Both road mix and plant mix construction are employed.

1938—ROAD IMPROVEMENT—1939
Nebraska

Mileage constructed in 1938	882
Hard surface (concrete, brick, block)	53
Bituminous types (including surface treated stabilized bases)	370
Graded and drained (including gravel or other untreated mineral surfaces)	459
Expenditures for 1938	$11,024,237
Construction	8,069,618
Maintenance	2,954,619
Equipment (construction and maintenance), not segregated from above.	

Missouri seeks cheaper types

C. W. BROWN, chief engineer, state highway department, reports need of additional road money. There is a continuous and constant demand for more miles of supplementary roads, and there is the necessity for more extensive outlay for the improvement and modernization of the major or trunk system. For the above reasons it is evident that the matter of the proper financing of the highway department is the most important problem in this state. Declining revenues coupled with continuing pressure for more mileage, more improvement, etc., demand that the search be continued for a road type that is cheaper to build and maintain and, at the same time, affords a serviceable and satisfactory artery of travel. No major changes have been made in design, methods or maintenance, but the department has made real progress in the matter of traffic service by the establishment of a separate, ably staffed bureau. The conditions recited prevailed in 1938 and, in the absence of legislation on the subject, will continue during 1939.

1938—ROAD IMPROVEMENT—1939
Missouri

Contract mileage awarded in 1938	433
Hard surface (concrete, brick, block)	57
Bituminous types (including surface treated stabilized bases)	72
Graded and drained (including gravel or other untreated mineral surfaces)	304
Expenditures for 1938	$13,235,733*
Construction	8,168,787
Maintenance	4,403,852
Construction—100 per cent federal grants	663,094
Estimated expenditures for 1939	$12,657,500
Construction	6,457,500*
Maintenance	6,200,000

* This does not include 100 per cent federal grants which amount to $2,243,300.

Arkansas revises accounting

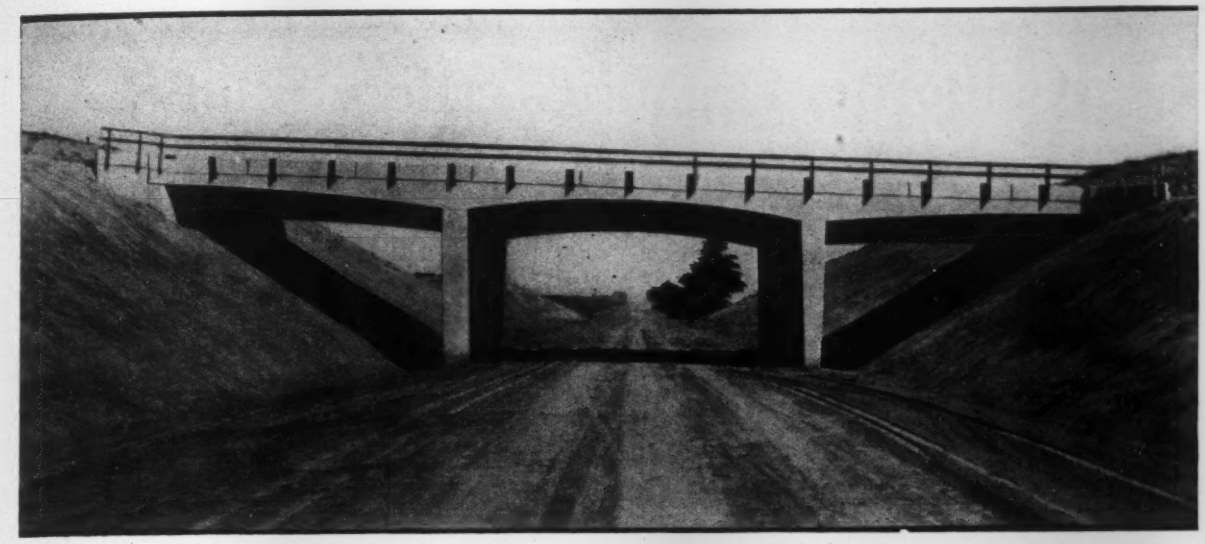
W. W. MITCHELL, director of state highways, announces a new order in highway accounting. The highway department is now engaged in a complete revision of its accounting system, whereby control of expenditures is to be accomplished by carrying commitments in constant comparison with the budget rather than by the antiquated method whereby fixed charges, cash and bills-payable have been used. This plan also contemplates placing all equipment on a rental basis whereby charges on a predetermined basis will be levied against each road and section or operation according to the time employed. The work figures for 1938 and as estimated for 1939 are as follows:

1938—ROAD IMPROVEMENT—1939
Arkansas

Mileage constructed in 1938	780.5
Hard surface (concrete, brick, block)	40.6
Bituminous types (including surface treated stabilized bases)	484.5
Graded and drained (including gravel or other untreated min-mineral surfaces)	255.4
Expenditures for 1938	$17,200,557
Construction	5,524,543
Maintenance	3,020,544
Debt service	8,655,470
Estimated expenditures for 1939	$15,925,470
Construction	4,250,000
Maintenance	3,020,000
Debt service	8,655,470

Iowa requires more roads

C. KOYKENDALL, administration engineer, state highway commission, emphasizes traffic demand for more roads. He says: "We still have a very substantial amount of work to do on our primary road system to bring it to a standard that is only moderately adequate for the needs of traffic. In saying this we are not thinking of building any super-highways, nor of extending diagonal highways from the cen-



Grade separations are becoming more and more the accepted safety measure where heavy-traffic roads cross, as in case of these Nebraska highways where Route 31 was carried under West Dodge St., Omaha.

ter to the corner of the state to facilitate or expedite primary-road traffic, we only have in mind the completion of gaps on important highways that must be completed before traffic can be said to be moderately well served.

"A similar situation is true with reference to secondary roads. In many of our counties, particularly in southern Iowa where secondary road-building costs are heavy, it is quite impossible under existing income to expand surfaced secondary-road services to anything like the extent that is desirable. In other words, on both primary roads and secondary roads our problem is principally one of financing. There are, of course, many technical problems yet unsolved, particularly the development of a design for low- or intermediate-cost roads that will satisfactorily meet traffic needs on roads of lesser importance. We believe, however, that some progress is being made in meeting the technical problems."

1938—ROAD IMPROVEMENT—1939

Iowa

Mileage constructed in 1938	
Hard surface (concrete, brick, block)	292
Bituminous types (including surface treated stabilized bases)	84
Graded and drained (including gravel or other untreated mineral surfaces)	179
Expenditures for 1938	
Construction	$12,979,376
Maintenance	4,009,030
Equipment (construction and maintenance)	259,077
Estimated expenditures for 1939	
Construction	$11,000,000
Maintenance	4,000,000
Equipment (construction and maintenance)	250,000

Oklahoma reorganizes

A THREE-MAN COMMISSION created by the state legislature Jan. 18, 1939 is now reorganizing the highway department. J. E. Goss, federal-aid engineer, reports figures for 1938 and 1939 as follows:

1938—ROAD IMPROVEMENT—1939

Oklahoma

Mileage constructed in 1938	497
Hard surface (concrete, brick, block)	93
Bituminous types (including surface treated stabilized bases)	218
Graded and drained (including gravel or other untreated mineral surfaces)	186
Expenditures for 1938	$12,413,200
Construction	9,472,500*
Equipment (construction and maintenance)	85,790**
Estimated expenditures for 1939	8,825,000
Construction	6,250,000
Maintenance	2,500,000
Equipment (construction and maintenance)	75,000

* Books not yet closed. Full year estimated on basis of first 10 months.

** Cars and trucks and road machinery.

Texas improves organization

JULIAN MONTGOMERY, state highway engineer, classes the outstanding activities of 1938 as organization and research, with standardization of maintenance, design and construction only slightly subordinated in importance.

During 1938 an independent survey was made by C. P. Owens of the Missouri highway department, of all paper work of the Texas highway department—ordinarily termed "red tape"—as well as of methods and procedures of both field and office. A compensation insurance division of the department was established and such insurance is now provided for all field employees, some 7,000 in number. The total cost for the first year, 1938, was less than 2 per cent of the labor payroll. A traffic and safety division was also established, and the total number of highway accidents in Texas since this division of the department was added has been reduced by some 40 per cent.

Experimental projects in soil stabilization were constructed and tested, and studies made of soil stabilization projects in most of the southern states. Specifications were standardized and printed in book form.

1938—ROAD IMPROVEMENT—1939

Texas

Mileage constructed in 1938—Fiscal year	2951
Hard surface (concrete, brick, block)	330
Bituminous types (including surface treated stabilized bases)	962
Graded and drained (including gravel or other untreated mineral surfaces)	1659
Expenditures for 1938—Fiscal year	$39,912,419*
Construction	28,985,231
Maintenance	8,543,681
Equipment (maintenance)	359,171
Estimated expenditures for 1939	$39,500,000*
Construction	30,000,000
Maintenance	8,034,155
Equipment (construction and maintenance)	350,000

* Includes legislative appropriations for administration and expense of state highway patrol.

The trend of activities for 1939 is toward an additional and intermediate step in road construction; more elaborate laboratory control of selection and use of local materials; waterproofing the subgrade crown for stabilizing the water content; establishing an inspectors' school to standardize construction methods; an increased number of asphalt and cement soil stabilization projects; scientific application of state-wide planning survey data, especially for the preparation of regional highway plans for metropolitan areas; and more rigid and elaborate traffic control.

California Organizes Safety Study

G. T. McCoy

Assistant State Highway Engineer, Sacramento Calif.

In 1938, a safety engineer was appointed to collect and correlate all material relating to accidents on the California state highway system and to make studies leading toward the provision of highway facilities that will give motorists the maximum in protection. The effort is being made to approach the problem on a scientific basis with the foundations resting upon facts.

The state highway system in California, as in most states, is divided into units of county, route and section, i.e. each route within a county is divided into convenient sections 10 to 20 mi. long. The newly formed department under the direction of the safety engineer has charted the accident history of each section. On a reduced plan of each section, which shows alignment, accidents are platted by means of circles, and at points where more than one accident occurs the circles are placed concentrically. This platting immediately shows up locations of repeated accidents.

For each such location detailed studies are then made of the accident reports, and the road conditions at the location are studied in both field and office to determine the part played by the road in the accident. From these studies it is possible in many instances to reach conclusions relative to faulty road conditions which may be corrected to eliminate the danger point.

With about 14,000 mi. of road in the state system, the task of reducing this information to charts and plats is one of considerable magnitude.

In highway design and construction, California, during 1938, began to see the results from the adoption in the fall of 1937 of wider traffic lanes. The 11-ft. lanes, now standard on two-lane roads, and 12-ft. inside lanes on multiple-lane pavements have certainly provided better facilities for free movement of present-day traffic.

Multiple-lane divided highways on high-speed arterials are receiving more and more attention, and the use of recessed curbing for light reflection for curbed median strips is proving of value.

The year 1938 has seen more study given to the design of highway intersections where traffic is such that separation of grades is not economically justified. The proper channelizing of traffic at such intersections by means of islands or pavement markings, with simple, intelligible signing which requires no hesitation by the driver is a vital safety factor. Definite patterns for various types of intersections have been formulated to carry traffic through and across them with maximum safety and minimum delay. The provision of accelerating and decelerating lanes for the use of vehicles entering or leaving such intersections is a most important phase of the design.

1938—ROAD IMPROVEMENT—1939

California	
Mileage constructed in 1938....	538
Hard surface (concrete, brick, block)	87
Bituminous types (including surface treated stabilized bases)	376
Graded and drained (including gravel or other untreated mineral surfaces)	75
Expenditures for 1938.....	$35,084,300
Construction	23,446,300
Maintenance	11,538,000
Equipment (construction and maintenance)	100,000
Estimated expenditures for 1939	$27,500,000
Construction	18,400,000
Maintenance	9,000,000
Equipment (construction and maintenance)	100,000

Four-lane dual highways in California have been greatly improved in design and appearance during the last few years.

Oregon Seeks More Finished Design

S. H. PROBERT

Office Engineer, Oregon Highway Commission, Salem, Ore.

THE roadbuilding situation in Oregon continues to be favorable. The demand for road improvement is greater than ever before and the sentiment of the people is definitely opposed both to diversion of highway income and to reduction in highway revenue. Motorists are appreciative of the benefits of high-standard road improvement and are willing to pay for it. There is, of course, the clamor of special interests for lower fees and for the diversion of income, but it is having no widespread effect. It appears that highway affairs will continue to ride on an even keel for another year at least.

Construction and expenditures for 1938 and the estimated probable expenditures for the present year are given in the table.

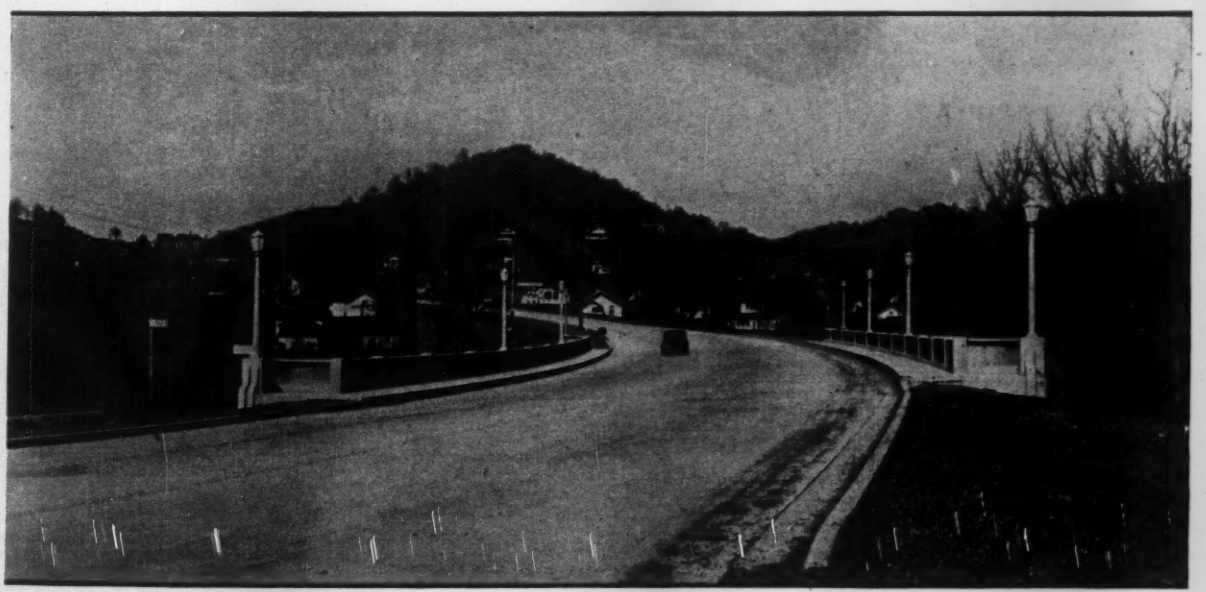
1938—ROAD IMPROVEMENT—1939

Oregon	
Mileage constructed in 1938	700
Hard surface (concrete, brick, block)	27
Bituminous types (including surface treated stabilized bases)	348
Graded and drained (including gravel or other untreated mineral surfaces)	325
Expenditures for 1938	$14,346,430
Construction	5,132,058
Maintenance	3,444,137
Equipment (construction and maintenance)	178,861
Estimated expenditures for 1939	$14,275,000
Construction	5,993,000
Maintenance	3,360,000
Equipment (construction and maintenance)	300,000

There is no tendency in roadbuilding policies toward any particular kind or type of construction. No major change or advancement has been made during 1938, or is in immediate prospect, but gradual improvement in all types and kinds of construction and maintenance has taken place. Better compaction of roadbeds, stronger foundations, more finished workmanship, smoother surfaces, better detours, wider bridges, greater mileages of dust-proof roads, more complete marking and signing and elimination of grade crossing hazards, all are moving forward simultaneously, and it cannot be said that any one of them has, during 1938, been given more attention than any other.

The closing out of the large federal emergency and work relief programs and the reductions made in federal-aid authorizations have resulted in a rather sudden and drastic curtailment of highway improvement work. This, in turn, has taken away employment for a large part of the highway contracting organization and has noticeably increased the keenness of competition in the contracting field. It is quite apparent that private enterprise has not yet fully absorbed the contracting facilities which the falling-off in highway construction has released.

In the state legislature, pressure is being applied by truck interests, as usual, to secure legislation permitting the use of heavier and longer loads. Other legislation under consideration includes a bill calling for zone control of speed limits. This bill would empower the highway commission to establish maximum speed limits to suit the safe-speed capacities of the different highways and sections of highway. At present, Oregon laws provide no specific maximums for speeds on rural highways.



Entering Roseburg, Oregon, on the Pacific Highway which is being reconstructed from Ashland, Ore., over the Siskiyou Mountains south to the California state line.

Washington Improves Design Standards

H. G. PORAK

Engineer, Plans and Surveys, Department of Highways, Olympia, Wash.

LAST YEAR witnessed material progress in the location standards for Washington highways through the adoption of transition spirals or easement curves for all circular curves. Primary highways in the future will be designed for a speed of 80 mi. per hour with curves not to exceed 5½ deg., and secondary highways will be designed for a speed of not less than 40 mi. per hour with curves not greater than 15 deg. Where these standards cannot be obtained on a particular section of highway, the curves are posted with proper caution and speed-limit signs. All curves of 1 deg. or more are superelevated. Grades are carried at the center line regardless of width unless satisfactory drainage cannot be obtained by doing so. The maximum rate of superelevation is 0.13 ft. per foot of width. The standard sight distance for 80-mi. highways is 1,230 ft. and that for 40-mi. highways is 400 ft.

Highways have also been divided into six different classes for which design standards have been prescribed. Thus, design and classification of the primary and secondary state highways have been greatly facilitated by the data provided through the planning surveys undertaken in cooperation with the Bureau of Public Roads. Greater attention has been given to the proper construction and compaction of embankments and to the investigation and classification of subsoils and foundation conditions. The design of highway structures has been advanced by giving greater attention to the architectural features and through the use of continuous and rigid-frame structures wherever possible.

While expenditures in 1938 were not greatly in excess of those of an average year, the normal program was augmented by the programs initiated under the federal public works appropriation acts of 1935 and 1938. The greater portion of these expenditures will be reflected in the 1939 statements. A few of the major PWA projects are as follows:

1. Puget Island bridge between Cathlamet and Puget Island over the Columbia River, consisting of a steel deck-truss bridge with reinforced-concrete and timber approaches, $516,500.

2. Hylebos bridge over the Tacoma waterway in Tacoma, consisting of a steel bascule with approaches, $381,293.

3. Lake Washington bridge between Seattle and the mainland via Mercer Island, consisting of a pontoon bridge with reinforced concrete approaches having a total length of 6,560 ft. and a width sufficient to accommodate four lanes of mixed traffic, $8,500,000.

4. The Tacoma Narrows bridge over an arm of Puget Sound near Tacoma, consisting of a suspension bridge with reinforced concrete approaches having a total length of 5,000 ft., $16,500,000.

The Narrows bridge at Tacoma and the Lake Washington bridge near Seattle are being carried out by the Washington Toll Bridge Authority of which the director of highways is chief engineer.

Under the new highway code, in the interests of safety, the department has adopted and provided reflectorized road markers and signs which greatly contribute to the safety of night driving. The department continued the operation of its system of weighing stations for the regulation of truck loadings. This regulation was extended to include the inspection of vehicles to insure that they are not defective and are safe to operate on the public highways.

The new four-lane road between Olympia and Nisqually represents arterial road design by the Washington state department of highways.

1938—ROAD IMPROVEMENT—1939

	Washington
Mileage constructed in 1938	948
Hard surface (concrete, brick, block)	24
Bituminous types (including surface treated stabilized bases)	606
Graded and drained (including gravel or other untreated mineral surfaces)	318
Expenditures for 1938	$11,869,900
Construction	8,501,900
Maintenance	3,368,000
Equipment (construction and maintenance)	187,200*
Estimated expenditures for 1939	$10,056,000
Construction	6,456,000
Maintenance	3,600,000
Equipment (construction and maintenance)	300,000*

* Distributed in maintenance.

Idaho Stabilizes Roadbuilding Employment

J. H. CLABBY

Staff Engineer, Department of Public Works, Boise, Idaho

PRIOR TO JUNE 3, 1938, there was no stringent procedure in the department for the employment of labor. Idaho now has the Idaho State Employment Service, affiliated with the U. S. Employment Service of the Department of Labor and administered by the State Industrial Accident Board. The agency's files now contain the work record and qualifications of almost every job-seeker in the state.

Labor is defined as all miscellaneous skilled, intermediate-grade, and unskilled employees, exempting only engineering staffs and supervisory, office, and clerical workers.

The procedure is simple. When an employing officer requires labor he requisitions the state employment agency serving his particular area. This he does in writing, on a prescribed form, stating the number of workers desired, their necessary qualifications, and the exact classifications under which they are to work. The labor requirements are anticipated as far in advance as possible.

The employment office thereupon refers qualified men, seeking always to assign the most deserving applicants, giving special attention to Idaho residential requirements.

It is, of course, necessary for any laborer seeking employment in this department to be registered at the state employment service office serving the area in which he desires to work.

No laborer who has been employed is displaced or his services terminated during continuance of the work of the kind on which he is employed unless his work is unsatisfactory to the employing officer. The latter is the sole judge of the employee's competency and he is required to use his judgment in a spirit of fairness, without consideration of personalities or outside influences.

Only in emergencies can labor be employed without reference to the state employment service. Emergency work is regarded as any work which must be performed in order to relieve serious interruption to traffic or work which is necessary for the protection of property or human life.

Operators of power equipment, in the skilled and intermediate grades, may be transferred with the equipment from one project to another within the district or within the state. All other labor must be hired through the employment office serving the particular community in which the work is being done.

1938—ROAD IMPROVEMENT—1939

	Idaho
Mileage constructed in 1938	448.6
Hard surface (concrete, brick, block)	4.9
Bituminous types (including surface treated stabilized bases)	277.0
Graded and drained (including gravel or other untreated mineral surfaces)	166.7
Expenditures for 1938	$7,079,333
Construction	5,192,138
Maintenance	1,286,367
Equipment (construction and maintenance)	600,833

Constant maintenance keeps Idaho's oil roads in condition for fast traffic.

Wyoming, the Oiled-Road State

C. F. SEIFRIED

Superintendent-Engineer, State Highway Department, Cheyenne, Wyo.

WYOMING is often called the oiled-road state and it is rather proud of the designation. Of 3,773 mi. of state highway at the end of 1938, 3,117 mi. were oiled, and the present year will see about 150 mi. oiled and probably an equal mileage graded; and grading normally includes a dust-laying oil treatment.

The oiled roads of Wyoming are a logical development. The state has about 23,000 mi. of highway of which 3,773 mi. are in the state system. Of the total mileage of state system roads only 2,461 mi. carry over 300 vehicles. This traffic is about 48 per cent local passenger cars, 33 per cent foreign passenger cars (mostly tourist travel) and 19 per cent trucks. The annual increase in traffic is about 5 per cent, truck traffic the greatest, local cars next and tourist cars the least. From the beginning of the oiling program, about a decade ago, service of local passenger cars has continued the most important function of road improvement and service of tourist traffic came next because of its revenue.

Keeping the foregoing facts in mind, a fourfold program has been set up: first, the construction and reconstruction of highways to reduce maintenance costs and eliminate, to a large extent, accidents; second, keeping the highways which are interstate and used largely by foreign traffic up to a high standard; third, improving the various roads leading to the Yellowstone National Park, as that is considered one of the greatest tourist attractions in the United States; and fourth, raising the standards of a great many stub or feeder roads.

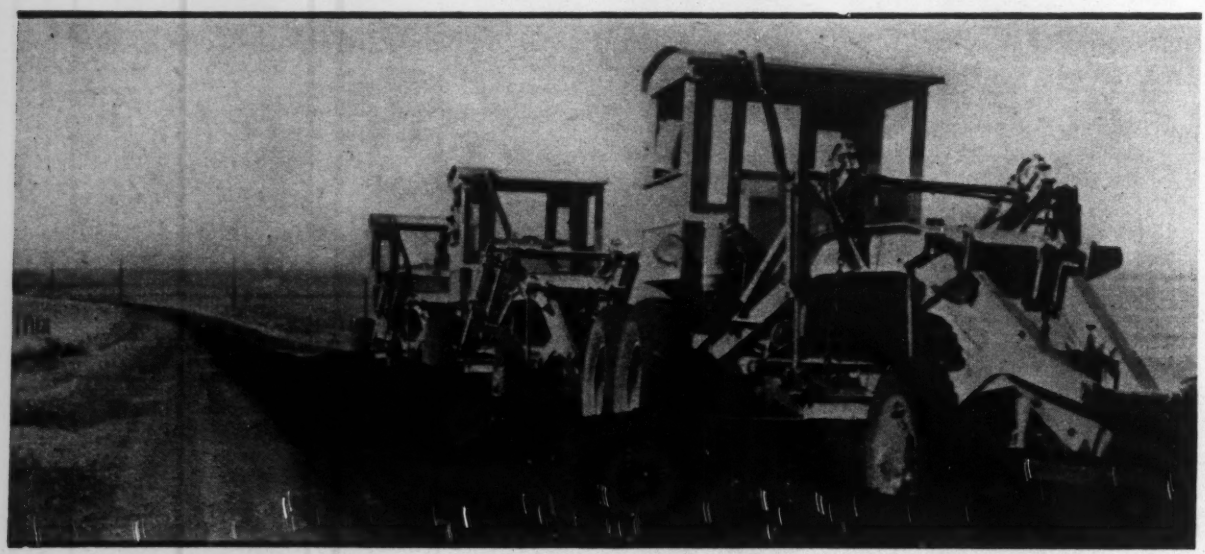
1938—ROAD IMPROVEMENT—1939

Wyoming	
Mileage constructed in 1938.....	370
Hard surface (concrete, brick, block)	....
Bituminous types (including surface treated stabilized bases)	185
Graded and drained (including gravel or other untreated mineral surfaces)	185
Expenditures for 1938.....	$5,350,000
Construction	4,500,000
Maintenance	850,000
Estimated expenditures for 1939.	$4,350,000
Construction	3,500,000
Maintenance	850,000

In the construction, during the past biennium, the first four classes of highways have received attention. Considerable reconstruction work has been done on the heavier traveled roads of the state system.

At first it was necessary to construct a lower type of surface in order to get as much oiled mileage as possible. In a great many cases low-cost temporary surfaces were placed, which during the past four years have had to be reconstructed.

The newer roads are of higher types. On the five principal routes of the state all new construction is being based on an 80 mi. per hr. speed standard. Roadway widths of 36 ft. are used with a 24-ft. oiled way laid between graveled shoulders. The department adheres to a standard 11-ft. minimum width of traffic lane. With the center-line strips and allowing ample shoulder width, the construction of the 36-ft. roadway proves to be almost ideal for two-lane roads. On the other routes of the state a lower speed standard is used and a 30-ft. roadway having a 22-ft. oiled mat is constructed with 4 ft. for shoulders on each side. These routes carry traffic that is predominantly local. In the first classification the sight distance is 1000 ft. and in the second it is 600 ft.



Oil-mix road surfacing has been increased to large mileages in Wyoming by the use of the best types of equipment.

Colorado Completes Across-State Routes

CHARLES D. VAIL
State Highway Engineer, Denver Colo.

THE COLORADO State Highway Department concentrated its work in 1938 primarily on construction and the bringing of state highways up to modern standards. This is a continuation of a program inaugurated in 1936 which has for its objective the completion of main east-west and north-south highways through the state. When the 1939 program is finished practically all of these routes will be completed for the first time in the state's history.

With the construction program goes the practice of adopting the most modern standards for the roads. These include the straightening of highways to provide long-distance vision, making them wider, providing better grades and widening curves so as to afford a minimum vision of 600 to 1,000 ft.

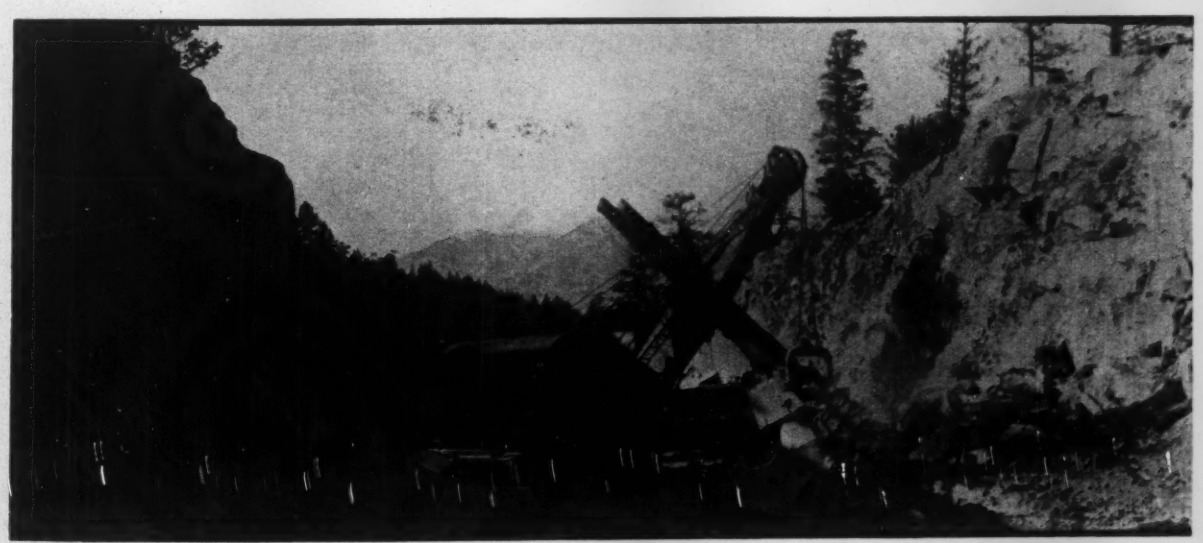
In 1936, Colorado issued $25,000,000 of anticipation warrants for highway construction. To these funds were added the regular federal-aid grants, federal funds for grade crossing elimniations, about $3,500,000 in grants from the public works administration and the annual receipts from gasoline taxes and motor vehicle licenses. To carry out the program, the legislature made the highway department a body corporate, with the governor and the seven members of its advisory board as trustees. Revenues from the gasoline tax and motor vehicle licenses are security for the anticipation warrants. About 1,750 mi. of highways have been improved under the program. Much of the construction is unique, such as the building of the Mount Evans highway above timberline. Mount Evans, which is located 50 mi. west of Denver, has an elevation of 14,260 ft. above sea level and the road to its summit is one of the highest highways in the world. This highway will be improved with an oil surface this year.

Colorado's 1939 program will involve the expenditure of about $9,000,000 for construction. These funds will come from two sources: (1) a carry-over of about $6,000,000 from the 1937 and 1938 budgets and (2) current receipts for 1939. When it is concluded the state's east-west and north-south main roads will be completed all the way for the first time in the state's history. The state now has 3,667 mi. of concrete and oil-processed highways and to this will add another 400 mi. in 1939.

Because of topographical barriers, the total number of feet of ascent and descent of many of Colorado's most popular highways far exceed the average of other states. An analysis of 4,260 mi. on 14 of the state's principal highways from Denver west shows that the average ascent on each is 9,325 ft. east to west, and the average descent 9,520 ft. An extreme in this particular is found on U. S. 160, west from Denver to the Utah state line, where the aggregate rise is 15,650 ft. and the fall 14,840 ft.

1938—ROAD IMPROVEMENT—1939

Colorado	
Mileage constructed in 1938	495
Hard surface (concrete, brick, block)	
Bituminous types (including surface treated stabilized bases)	495
Graded and drained (including gravel or other untreated mineral surfaces)	495
Expenditures for 1938	$16,991,454
Construction, including oil-surfacing	13,734,917
Maintenance	1,314,788
Equipment (construction and maintenance)	346,309
Estimated expenditures for 1939	$12,500,000
Construction, including oil-surfacing	9,250,000
Maintenance	1,350,000
Equipment (construction and maintenance)	200,000



Colorado's mountain highways must be built through solid rock; this is a section between Denver and Estes Park.

Montana Stresses Reconstruction

D. L. CHENEY

Bituminous Engineer, State Highway Commission, Helena, Mont.

MONTANA is a state of sparse population, long road distances and motorists who expect the roads to be such that they can travel fast. The problem of the state is to provide these long, fast roads without very much money. This is being done by a stage-construction program that starts with an asphalt-mix surface but with geometrical standards (line, profile and cross-section) that meet the highest of modern requirements for fast travel.

Previous to the past few years, all roadbeds were constructed to a maximum width of 24 ft. with an 18-ft. driving surface. It has been found that this width is not sufficient to permit safe passage of vehicles under present traffic conditions so that the roadway is now increased to a minimum of 30 ft. by widening the 9-ft. lanes to 12 ft., thereby giving a driving surface width of 24 ft. This width adequately serves two-lane traffic.

Traffic does not and probably will not for some time justify the construction of roadways which will permit four-lane traffic, and three-lane surfaces are considered hazardous and unsatisfactory to such a degree that their use is not contemplated.

The design and construction of bridges and railway grade-separation and other structures is proceeding along the same lines as are road design and construction; we are constantly working toward the ideal of increasing the safety factor here as elsewhere. We are now designing many of our bridges so that the roadway width of the bridge is the same as the width of the road at the bridge ends. This practice is being generally applied up to spans of 150 ft. We are building much heavier handrails to withstand greater impacts and are also setting the handrails farther back from the curbs at the side of the bridge roadway to eliminate the possibility of motor vehicles sideswiping the rails.

A sharp trend has been noted during the past year for reconstruction of existing roadbeds and improvement of those highways carrying the maximum amount of traffic. In many instances entire reconstruction is necessary as the standards in use at the time of original construction are now obsolete to such a degree that it is not possible to correct the failures and defects without rebuilding the entire roadway. All reconstruction now in progress and that contemplated is based on higher standards of design.

Reconstruction standards and designs now used by the Montana highway department are based on true alignment, increased visibility, increased roadbed and surface widths, greater stability in bases, more adequate and higher type drainage and snow elimination. The last objective is met by raising grades above the natural ground which in turn increases the width of all ditches, thereby making room for snow storage when desired.

Montana has definitely raised its standards for securing right-of-way. The standard minimum for right-of-way is now 100 ft., except in unusual cases where costs are exorbitant or in cities or towns where improvements and developments already made will not permit such width. It is believed that this is an ultimate economy and that the wider right-of-way promotes the safety features that the state is trying to build into its highways.

Surfacing one of Montana's roads with its 24-ft. travel surface and wide roadway.

1938—ROAD IMPROVEMENT—1939

	Montana
Mileage constructed in 1938	230.9
Hard surface (concrete, brick, block)	0.3
Bituminous types (including surface treated stabilized bases)	44.3
Graded and drained (including gravel or other untreated mineral surfaces)	186.3
Expenditures for 1938	$4,571,372
Construction	2,477,000
Maintenance (including betterments)	1,888.486
Equipment (construction and maintenance)	205,886
Estimated expenditures for 1939	*$9,350,000
Construction	5,650,000
Maintenance	1,900,000
Equipment (construction and maintenance)	200,000
* Includes bond retirement and other expenses	1.600.000

Utah Keeps to the Pace of Traffic

E. C. KNOWLTON

Chief Engineer, State Road Commission, Salt Lake City, Utah.

THE INCREASED NUMBER of vehicles using the highways and the augmented weight and speed of traffic have changed materially within the past few years the older standards of design and construction of highways. In consequence, the principal objective of the road commission of Utah, since about 1929, has been to apply oil-mix or other bituminous surfacing to the main highways, both for economy in maintenance and to increase safety by eliminating the intolerable dust hazard. As a result, most of the mileage on the main highways has been improved to a dustless standard, which will reasonably handle traffic, although it is clearly evident that such improvement, except on roads of recent construction, is temporary in character and that further modernization will be required.

The road commission is now constructing two-lane highways of 22-ft. surfaced width, with 4- to 8-ft. shoulders, on the main highways and of 20-ft. surfaced width, with 2- to 3-ft. shoulders, on secondary roads, except on very light-traffic secondary roads on which an 18-ft. surface with 3-ft. shoulders is provided.

Adoption of a higher standard of vertical and horizontal curves during the past few years has greatly added to the safety of the road. On the main highways, attempt is made to obtain at least 2,000-ft.-radius horizontal curves except in mountainous country where costs would be prohibitive or where right-of-way costs would be very heavy. Another development toward safety is the adoption of flatter-fill slopes; on main highways a 1 on 4 fill slope is used on fills of 5 ft. or less and on secondary roads a slope of 1 on 3 on fills of less than 3 ft.

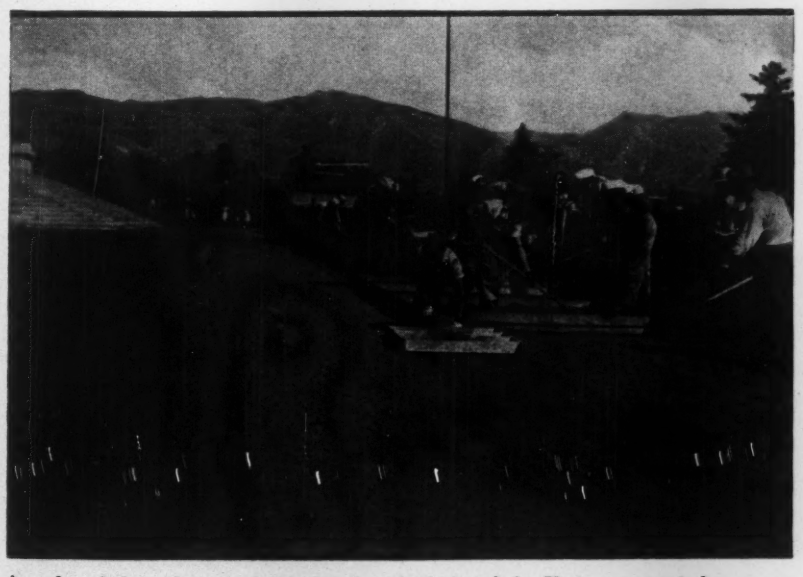
Another change is to provide increased stability of the pavement surface by thicker gravel bases and a more careful selection of borrow material for embankments. Gravel bases are in nearly all cases at least 9 in. thick and as much as 3 ft. thick where natural materials are unstable.

Embankments on main roads are now constructed in 1-ft. layers, loose measurement, in earth material and in variable thicknesses from 1 to 3 ft., depending on the size of rock, in rockfills. Earthfills are watered and rolled until at least 90 per cent of ultimate compaction is obtained.

As the traffic on most of the highway mileage of the state is still relatively light, the road-mix bituminous surface is most extensively used. This can be built at a cost of from $2,000 to $3,500 a mile.

An important factor which contributes to higher standards of construction is the evolution of construction equipment. Modern equipment will move road material at only a fraction of the cost of the older method by teams and fresnos. Power shovels are no longer used except in rock excavation or where hauling of the material in trucks is required. Even then, the improvement in power shovels, trucks and tires, and the reduction in their costs permits hauling of excavation material distances which would have been prohibitive even a few years ago. A comparison shows 44 c. per cu.yd. as the average bid price for excavation 10 years ago compared with 21.5c. in 1937.

Another notable improvement has been in gravel plants. The modern plants are portable, easily installed and moved and handle as high as 250 tons per hour. The average cost of crushed gravel, complete on roadway, ten years ago was $1.30 per ton as compared with 45.6c. in 1937.



A rock-asphalt surfacing job on the plaza in front of the Utah state capitol.

1938—ROAD IMPROVEMENT—1939

	Utah
Mileage constructed in 1938	231*
Hard surface (concrete, brick, block)	5
Bituminous types (including surface treated stabilized bases)	148
Graded and drained (including gravel or other untreated mineral surfaces)	78
Expenditures for 1938	$7,031,936
Construction	3,787,070
Maintenance	1,506,565
Equipment (construction and maintenance)	369,520
Estimated expenditures for 1939	$6,600,000
Construction	3,300,000
Maintenance	1,650,000
Equipment (construction and maintenance)	180,000

* In addition to this, 9 mi. of roadside development were constructed.

New Mexico Plans Secondary Road Financing

B. G. DWYRE

State Highway Engineer, Santa Fe, N. Mex.

APPROVAL for the issuance of $6,000,000 in highway debentures was sought in February with the introduction of a debenture bill in the New Mexico legislature. The bill which has the approval of Governor John E. Miles and the State Highway Commission would provide funds for matching federal-aid allotments and for New Mexico's sponsor share of WPA projects on secondary or feeder roads.

The secondary highway construction problem is one of the most important problems confronting the state. The highway system must be considered as an economic asset to the state, but one from which the greatest returns will not be realized until such time as the unpaved gaps in the primary system have been closed and the connecting links between the major highways have been paved. To obtain the greatest good from the investment already made the remaining gaps on the primary system should be completed as rapidly as possible. Most of these roads are on the federal-aid highway system and can be financed largely with government funds.

Any improvement to be made on the secondary highway system will have to be made largely from state funds. While the government has allotted about $250,000 for secondary highways in New Mexico, which must be matched by the state on a 38-62 basis, this amount of money will not go very far toward improving the secondary system since any additional improvement will have to come from state funds, and the only way that funds can be provided for this purpose is through issuance of highway debentures.

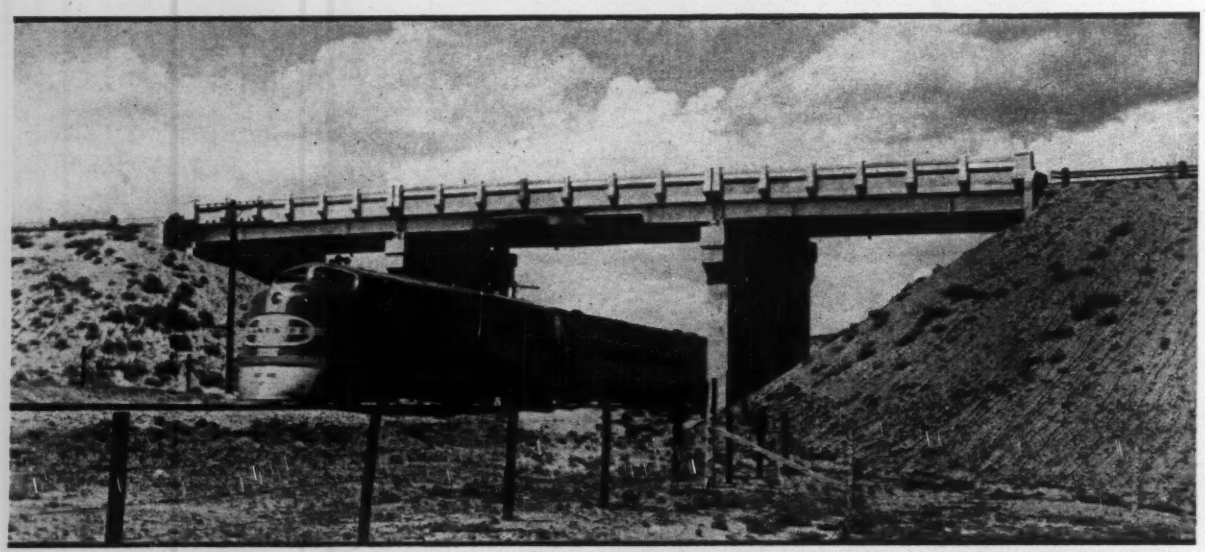
It is hoped that during the next two years the state will be able to do a considerable amount of construction on the secondary system in cooperation with WPA forces. Though this type of governmental aid may not prove a permanent means of assistance, advantage should be taken while it is still available. The full benefit of the present completed highways can be obtained only as soon as all unpaved gaps on the major highways are finished and all the connecting links paved.

During the last four years the income from the gasoline taxes has increased approximately 60 per cent. This means that in 1938 the state collected about $1,700,000 more from this source than in 1934. The greater portion of this increase was due to increased travel, resulting from improved roads. It is estimated that the income from gasoline taxes will continue to increase as the roads continue to be improved, providing the national economic conditions remain as at present. Due to this fact the state would be well justified in completing the highway system as rapidly as possible.

Aid from the federal government is being sought to improve the roads leading from the regular highways to the various points of interest, including national parks, and monuments, Indian reserves and pueblos.

1938—ROAD IMPROVEMENT—1939
New Mexico

Mileage constructed in 1938	722
Hard surface (concrete, brick, block)	0
Bituminous types (including surface treated stabilized bases)	415.9
Graded and drained (including gravel or other untreated mineral surfaces)	306.2
Expenditures for 1938	$8,643,557
Construction	6,936,594
Maintenance	1,472,735
Equipment (construction and maintenance)	234,228



High-speed trains have made grade separations a necessity on main roads in New Mexico.

Arizona Develops Balanced System

HOWARD A. REED

State Highway Engineer, Phoenix, Ariz.

THE PRINCIPAL NEED of Arizona, which is true perhaps of every state, is highway money. It would cost the state $29,000,000 to modernize its system, to bring every highway in the state up to highest standards. Lacking the touch of Midas, the problem is to make the money available for roads produce the most roads and best roads.

Arizona is small in population but great in area. The 3,701 mi. now in the state system must serve not only the citizens of Arizona, but thousands of out-of-state visitors, who averaged nearly 700,000 motor-vehicle miles of travel each day during 1938. While local traffic in 1938 was slightly greater than in 1937, out-of-state motor-vehicle travel increased more than 10 per cent. Highway operations in 1939, as they were in 1938, will be centered on those lanes of traffic which serve the thousands of motor vehicles coming from other states.

Arizona is striving for a balanced road program; it is the policy of the highway department to stress the maintenance of highways in all parts of the state. Reconstruction was an important development during 1938, and was apportioned evenly throughout the state. In constructing new roads, and in renovating and modernizing roads which have outserved their usefulness, the department has one purpose in mind: that the period of usefulness will extend for at least 20 years.

1938—ROAD IMPROVEMENT—1939

Arizona

Mileage constructed in 1938:	
Hard surface (concrete, brick, block)	4
Bituminous types (including surface treated stabilized bases)	194
Graded and drained (including gravel or other untreated mineral surfaces)	21
Expenditures for 1938	$5,973,980
Construction	4,493,470
Maintenance	1,339,283
Equipment (construction and maintenance)	141,227

Long-time planning, which will be cheaper in the long run, entails a greater expenditure in building today the road for tomorrow. Arizona is therefore building fewer miles of road today, but they are better roads. They are roads that will be less costly to maintain, and they are roads that will carry the volume of increasing traffic.

Exceptionally important has been the work of the highway planning survey of the Arizona highway department. This division has supplied valuable information as to traffic flow. The engineers are now in possession of the figures which they need in planning a long-range road program.

Studies of the traffic engineering division in 1938 have resulted in more careful marking of roads and have given a greater insight into the problem of the engineer in dealing with safety. It remains to the engineer, even more than to the teacher or to the law enforcement agencies, to make the road safe for travel. During 1938, for the first time in the history of the Arizona highway system, scientific methods of observation were applied by the traffic engineering division to a definite highway. This highway, the Blythe-Wickenburg highway, has been the scene of many serious automobile accidents. The studies have resulted in this road being set up as a special speed zone with a definite speed limit and further, each curve was tested and signed, showing the greatest speed at which the curve could be negotiated.

Modern Arizona highway practices present every quality alignment grade and cross-profile required by the best practice.

Nevada Faces Secondary-Road Problem

ROBERT A. ALLEN
State Highway Engineer, Carson City, Nev

NEVADA'S present highway system approximates 2,700 mi. of improved highway, all of which is surfaced but with many miles yet to be reconstructed to modern standards of width, alignment, grade and surface. The present system of transcontinental highways through the state is such as to be able to take care of World's Fair traffic without serious inconvenience or danger to any traveler if reasonable precautions are taken. Several construction jobs will be underway on these highways during the travel season, but surfaced detours will be provided for the convenience of the traveling public.

With the reduced funds available for construction of both primary and secondary roads and grade-crossing structures, the activities of the highway department will be curtailed about 25 per cent during the coming year. The revenues for maintenance of the present system are available and unimpaired, with a constitutional amendment against the diversion of special automobile taxes pending before the legislature for the second time. Good prospects for its passage exist. Upon passage, it will then be acted upon by the people at the next general election. The humor of the elector is such as to indicate the passage of this constitutional amendment. Highway revenues will then be legally protected for use on highway work.

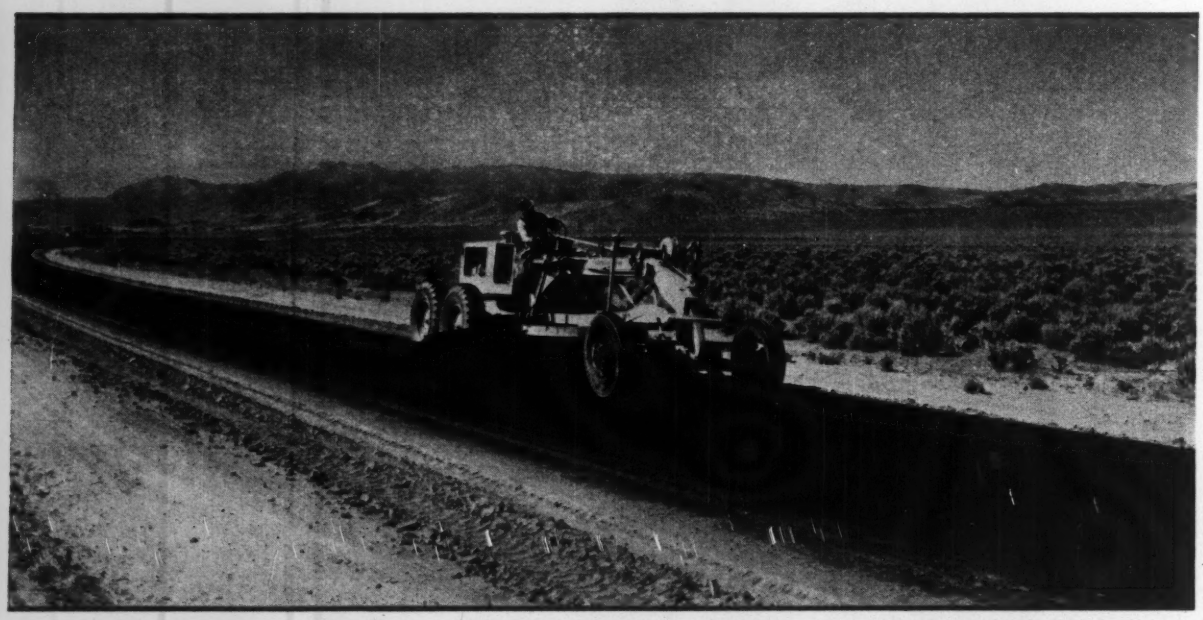
1938—ROAD IMPROVEMENT—1939

Nevada	
Mileage constructed in 1938*	328
Hard surface (concrete, brick, block)	....
Bituminous types (including surface treated stabilized bases)	255
Graded and drained (including gravel or other untreated mineral surfaces)	73
Expenditures for 1938	$4,738,360
Construction (complete and under contract)	3,849,097
Maintenance	825,426
Construction (complete and maintenance)	63,837
Estimated expenditures for 1939	4,020,080
Construction	3,170,080
Maintenance	850,000

* Complete and under contract.

The grade crossing elimination program has progressed to the point where we can see adequate protection for the traveling public on all transcontinental highways, both east-west, and north-south.

The secondary-road program, which comprises both farm-to-market and mine-to-market roads, has proceeded through its initial stages, and with the aid of the planning survey the state should be ready to adopt a secondary-road system, in compliance with the Bureau of Public Roads' regulations, that will adequately serve each and every county of the state. Funds for the secondary program are, however, extremely meager, and it will be many, many years before even a 25 per cent completion of the program can be realized. In the selection of the secondary system, and also in the selection of the primary system, the department of highways and the board of directors are being guided by the findings of the state-wide highway planning survey which has reached a point where its investigations are becoming of real value to the state. Priority for extensions will be based on the survey.



Auto-patrol grader prepares the oil mix for surfacing a road through a characteristic Nevada landscape near Reno.

Construction in the Far West

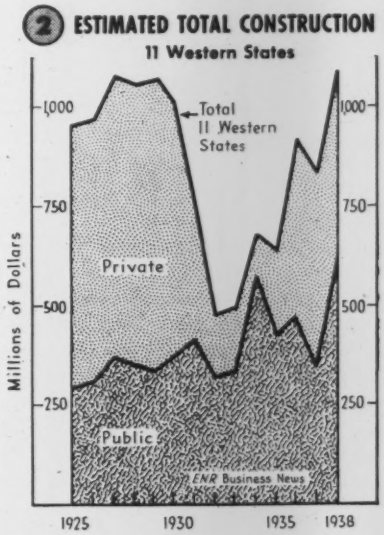
***Contents in Brief**—Graphs and tables of construction work in the eleven western states show that new records were set in 1938. Material shipments show general improvement though totals were not as high as 1936 and 1937. Building costs are slightly lower than the national average with no definite trend indicated. Labor rates show a rising trend.*

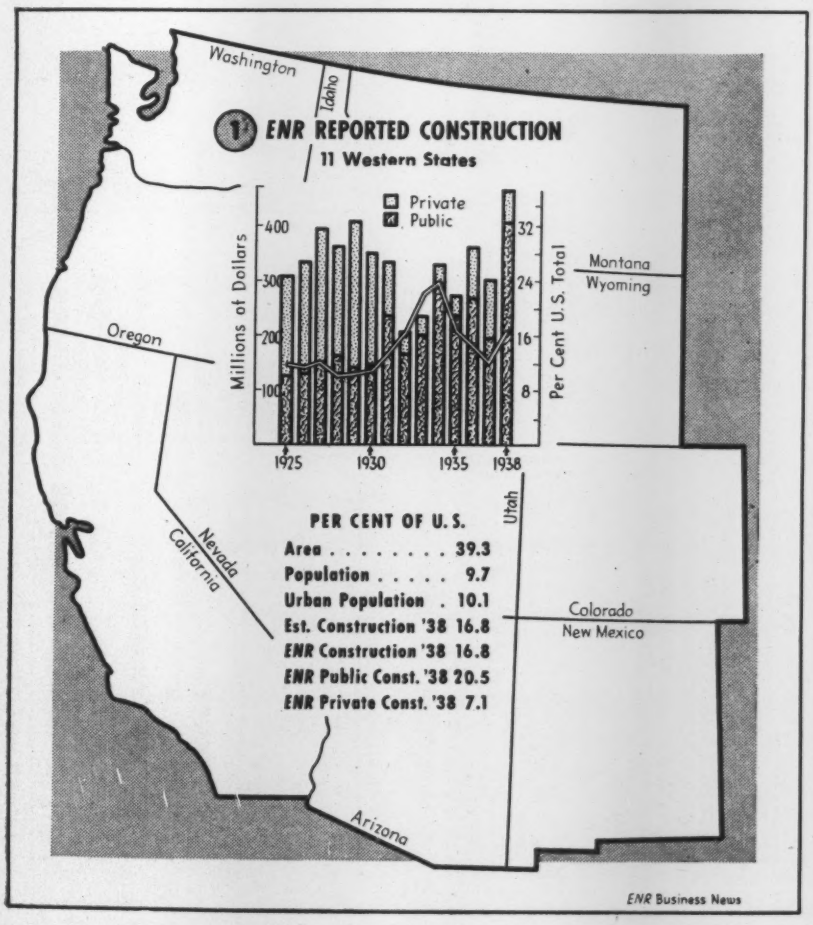
THE FAR WEST is establishing astonishing records of construction. Construction in 1938 in the eleven states of California, Oregon, Washington, Idaho, Utah, Nevada, Arizona, Montana, Wyoming, Colorado, and New Mexico, totalled 1,092 millions of dollars, a 31 per cent gain over 1937 and a 1.5 per cent higher total than in 1927, the previous record year. This is 16.8 per cent of the total estimated national construction volume.

The states that made this record represent 39 per cent of the area of the United States, they have 9.7 per cent of its total population and 10.1 per cent of its urban population. About 12 per cent of the service establishments and 13 per cent of the retail trade of the nation serve this population. Of the new housing units built in 1938, 21 per cent are in these eleven states. The natural resources include 15 per cent of the mines and quarries, but 19 per cent of the value of mine and quarry products and 20 per cent of the mineral production of the country. Of the nation's stand of saw timber, 79 per cent is in these eleven states.

The eleven states named have 8.4 per cent of the farms, but 22.4 per cent of farm acreage and 15 per cent of the farm property, land, buildings, implements, machinery and live stock. They produce 15 per cent of the gross farm income of the nation and 17 per cent of the farm cash income. These agricultural records are a triumph of irrigation engineering for these 11 states include 58 per cent of the irrigated states of the nation, 89 per cent of its irrigated acreage, and 90 per cent of its total investment in irrigation works.

In the development of these great





I — ESTIMATED CONSTRUCTION VOLUME IN 11 WESTERN STATES

(Millions of Dollars)

Year	Public	Private	Total
1925	$296	$661	$957
1926	312	659	971
1927	374	705	1,079
1928	355	704	1,059
1929	339	733	1,072
1930	374	639	1,013
1931	419	337	756
1932	324	156	480
1933	339	162	501
1934	573	110	683
1935	429	211	640
1936	476	441	917
1937	348	485	833
1938	619	473	1,092

natural resources during 1938, 57 per cent of the new construction expenditure was for public works and 43 per cent was for private investment in real or fixed wealth and in increased productive capacity. This year's public works construction, estimated at $619,000,000, tops all preceding years and exceeds 1937 by 78 per cent. It is 8 per cent above the former record of $573,000,000 in 1934. The private construction total, estimated at $473,000,000, is 2.5 per cent below 1937, but is higher than any other year since 1930.

Recorded construction

A continuous progress report on construction, which shows the rates of activity for various classes of engineering works, is furnished by the *Engineering News-Record* construction volume statistics. The *ENR* recorded construction volume total for 1938 is $467,000,000, which tops the previous record, that of 1929, by 14 per cent and exceeds 1937's volume by 54 per cent.

Earthwork, irrigation and waterways, streets and roads, and public buildings all set new construction records in the year just closed. Grand Coulee and Shasta Dam awards swelled the volume for the earthwork, irrigation, and waterways classification to an all-time high. That classification as well as roads and streets is normally high in the West.

In California, $35,000,000 in public building projects is more than half the building total for the 11 states; and $35,500,000 and $24,000,000 in highway lettings in Washington and California, respectively, are responsible for the street and road gain.

III — PWA NON-FEDERAL PROJECTS IN 11 WESTERN STATES

(Millions of Dollars)

State	Est. Tot. Cost	Total Allot.	Grant	No. of Proj.	Equit. Share*
Montana	$8.3	$4.9	$3.7	45	$4.0
Wyoming	2.8	1.3	1.3	22	1.2
Colorado	14.7	6.6	6.6	85	6.6
New Mexico	4.8	2.6	2.1	27	2.6
Idaho	4.4	2.1	2.0	67	2.6
Utah	5.8	2.9	2.6	61	2.9
Arizona	7.4	3.5	3.3	55	3.3
Nevada	1.1	.5	.5	11	.5
Washington	28.8	13.0	13.0	73	10.2
Oregon	9.9	5.1	4.5	141	5.1
California	63.3	29.8	28.5	292	30.3
Total, 11 Western States	**$151.3**	**$72.8**	**$68.1**	**879**	**$69.3**

* Equitable share of total funds computed on basis of population and employment needs.

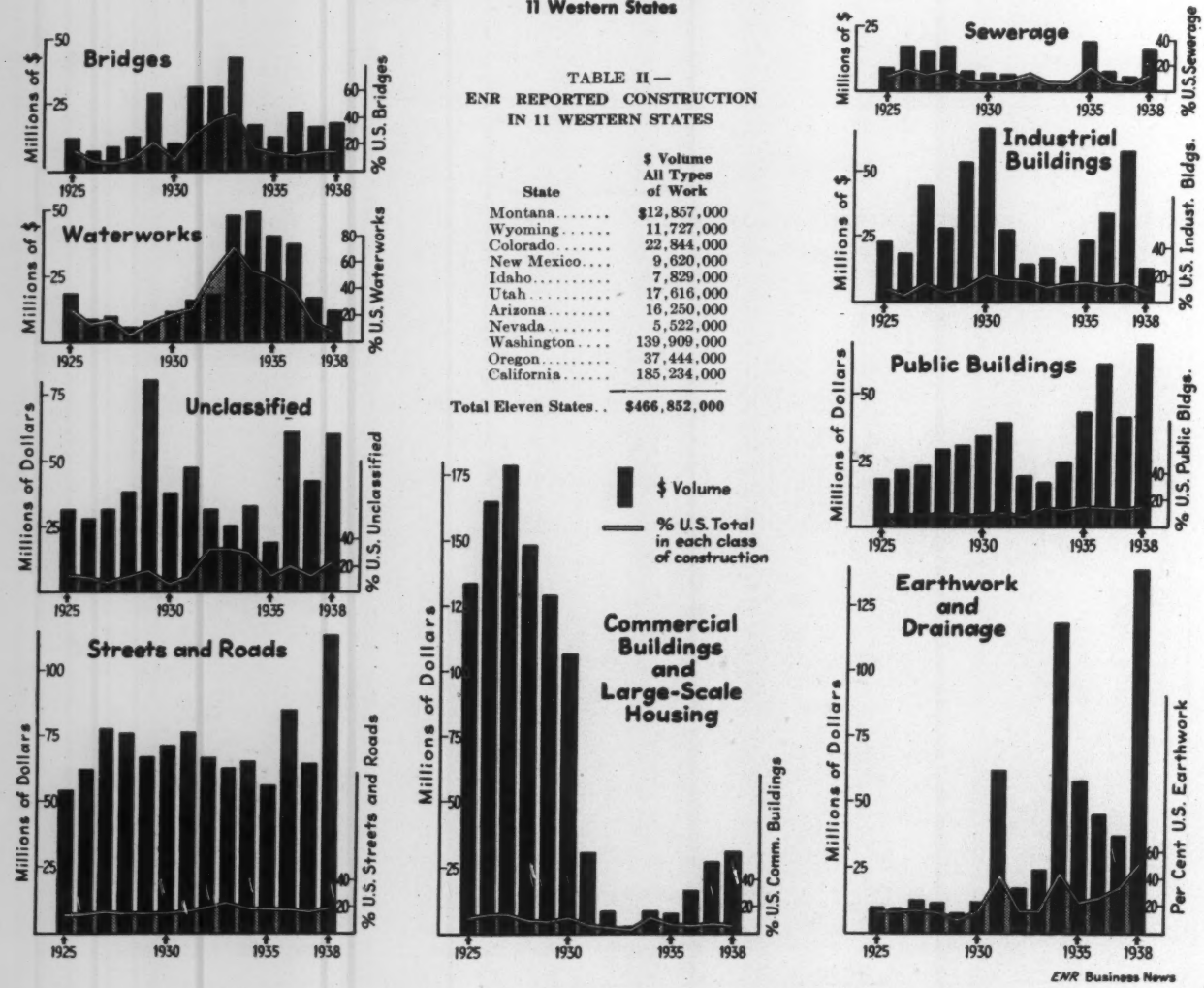
Sewerage, bridges, commercial building and large-scale housing, and unclassified construction, though not near their record years, report substantial gains over 1937. A graphic report of progress is given in the charts below.

3 ENR CONSTRUCTION VOLUME BY TYPE

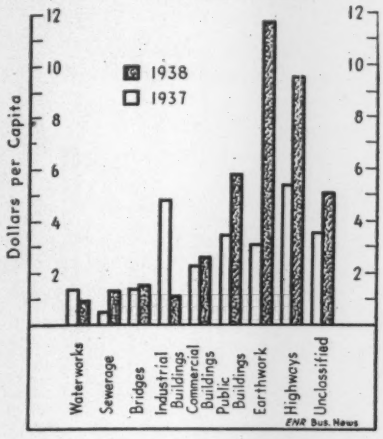
11 Western States

TABLE II — ENR REPORTED CONSTRUCTION IN 11 WESTERN STATES

State	$ Volume All Types of Work
Montana	$12,857,000
Wyoming	11,727,000
Colorado	22,844,000
New Mexico	9,620,000
Idaho	7,829,000
Utah	17,616,000
Arizona	16,250,000
Nevada	5,522,000
Washington	139,909,000
Oregon	37,444,000
California	185,234,000
Total Eleven States	**$466,852,000**



4 PER CAPITA CONSTRUCTION
11 Western States



More than $72,000,000 in PWA funds for non-federal construction purposes was made available to the Pacific and Rocky Mountain states by the 1938 program. With the aid of this money, about 10 per cent of the U. S. non-federal allotment total, 879 projects are to be built at the estimated cost of $151,000,000. California leads with non-federal allotments totaling $30,000,000 for 292 projects estimated at $63,000,000.

Construction per capita

Construction expenditures per capita average $39.27 for 1938, 73 per cent above the 1938 average for the country as a whole. In 1937 the 11 states of the Far West exceeded the national average by 28 per cent. Per capita expenditures of $34.48 for public construction in 1938, and of $4.79 for private construction compare with the national averages of $16.22 for public, and $6.53 for private construction.

Earthwork, irrigation and waterways lead all classes of work, with $11.63 per person. This is followed by highways with $9.53 per capita; public buildings, $5.76; unclassified construction, $5.02; commercial building and large-scale housing, $2.53; bridges, $1.51; sewerage, $1.34; industrial buildings, $1.04; and waterworks, $0.91.

Material Shipments and Employment

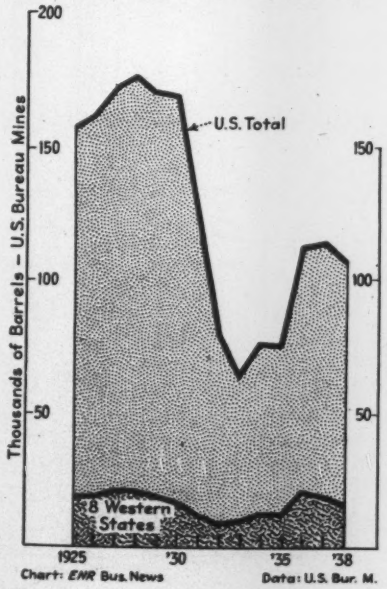
Almost 16,000,000 bbl. of portland cement were shipped in 1938 from mills in the eight cement-producing states in the Pacific and Rocky Mountain area, 15 per cent of the nation's total shipments. While 18 per cent below 1937 shipments, and 21 per cent below the record volume of 1936, 1938 shipments reported by the U. S. Bureau of Mines exceeded western shipments for the years 1931 through 1935. It is of interest that, since 1933, shipments from these western states have been about 15 per cent of the U. S. total, a gain from 1925 through 1931, when Pacific and Western cement shipments ranged from 9.8 per cent of the U. S. total in 1931 to 12 per cent in 1925.

Shipments of west coast woods, Douglas fir, western hemlock, Sitka spruce, and western pine finished last year are in substantially stronger positions than at the end of 1937, and at about the same levels as at the 1936 year-end. Average monthly shipments for the entire year, however, are 16 per cent lower than in both 1936 and 1937 for west coast woods, and 11 and 12 per cent lower, respectively, than in 1936 and 1937 for western pine. First quarter consumption for 1939 is forecast by the Department of Commerce to be 1,003,000,000 ft. b.m. for western pine, and 1,563,000,000 for west coast woods, just above the 1938 monthly average for western pine and 15 per cent higher for all west coast woods.

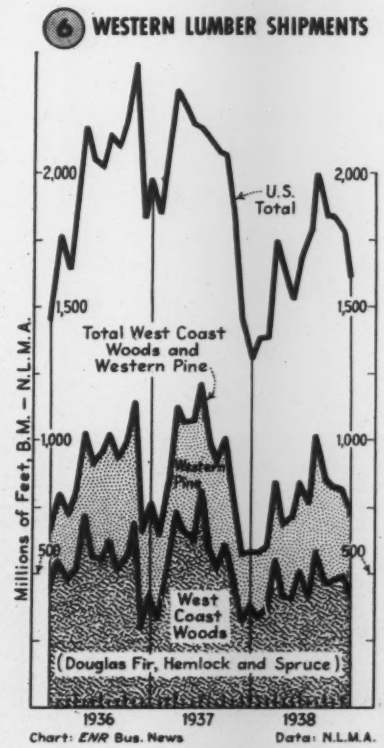
Employment

After dropping during the first quarter of 1938 to the lowest levels in the past three years, union build-

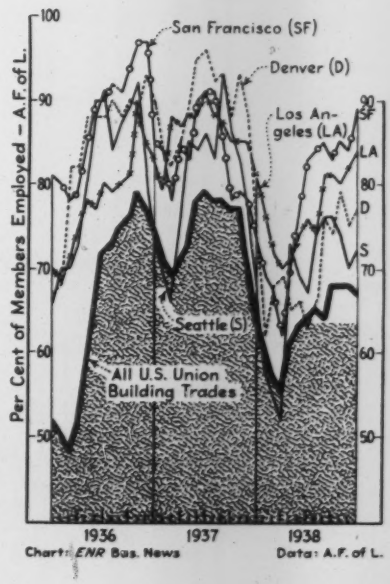
5 PORTLAND CEMENT SHIPMENTS
8 Western States and U.S. Total



6 WESTERN LUMBER SHIPMENTS



7 UNION BUILDING EMPLOYMENT
4 Western Cities

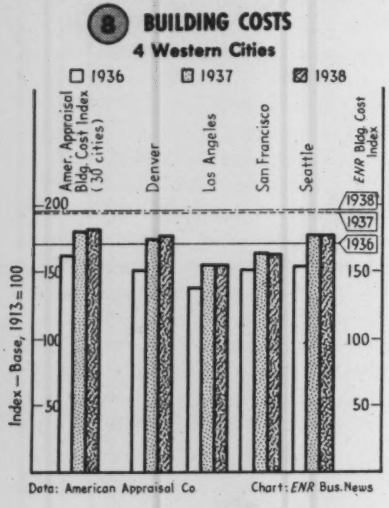


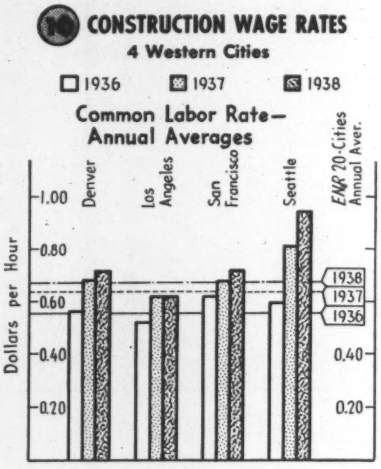
ing employment in four representative western cities has turned sharply upward. Though not near the peak employment levels of 1936 or 1937 in any of the cities, Denver, Los Angeles, San Francisco and Seattle, each has ended 1938 with strong gains over the first six months of the year, and each is in a relatively higher position than most cities, as indicated by the American Federation of Labor building-trade employment average.

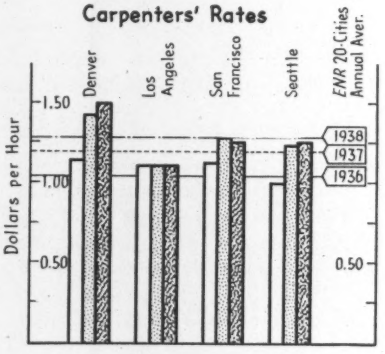
Building Costs and Wages

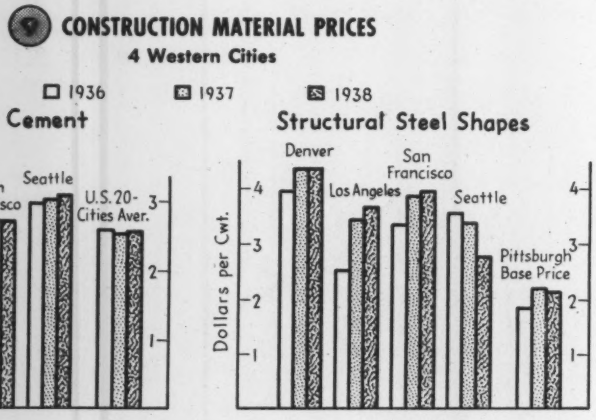
Building costs in the Pacific and Rocky Mountain states are slightly lower than the national average, but the reasons back of this showing are very mixed. Seattle, in the heart of the lumber country, naturally has a price advantage on lumber, San Francisco also reports low lumber costs. Los Angeles is low for cement, with San Francisco next. Denver and Los Angeles report low brick costs, Seattle and Los Angeles seem to be shifting positions on steel prices.

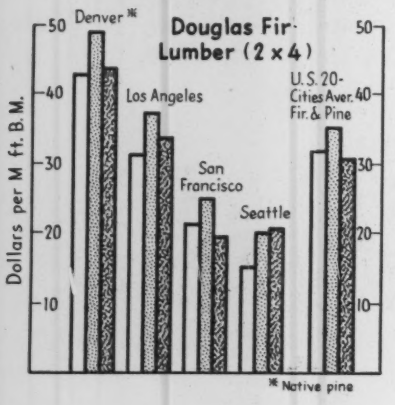
Wage rates for common labor show that Denver, San Francisco and Seattle all pay more than the *ENR* 20-cities average. For carpenters, only Denver pays more, for structural iron workers both San Francisco and Seattle pay slightly more than the *ENR* 20-cities average. For bricklayers both San Francisco and Seattle pay higher rates than the 20-cities average. A 3-year cost and price comparison is given herewith.

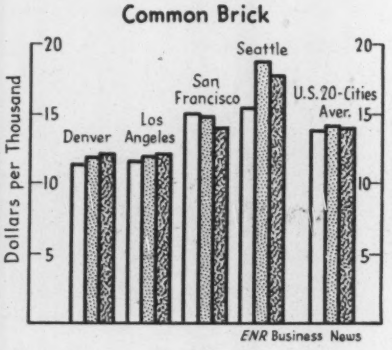


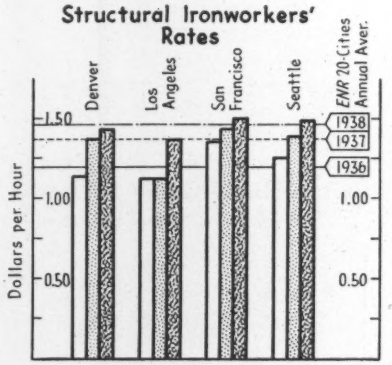


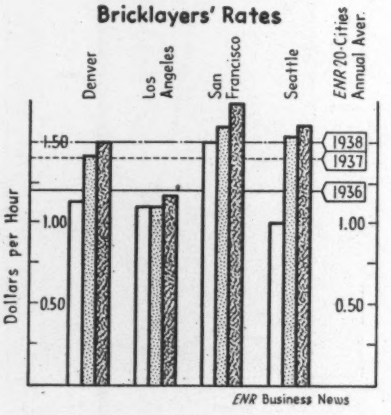












Construction Equipment Review

Equipment manufacturers serving the construction field have, in the past year or so, developed a wealth of new, improved and outstanding units. Their efforts have advanced the art of construction, resulting in more efficient, faster and cheaper operations that have kept construction costs down in the face of mounting labor rates and increased overhead costs. To give the buyer and user of construction equipment a check list of the latest developments, **Engineering News-Record** ***presents here a brief description of nearly 200 machines and tools. Although every effort has been made to present a complete list, there, obviously, can be no guarantee that every eligible product is included.***

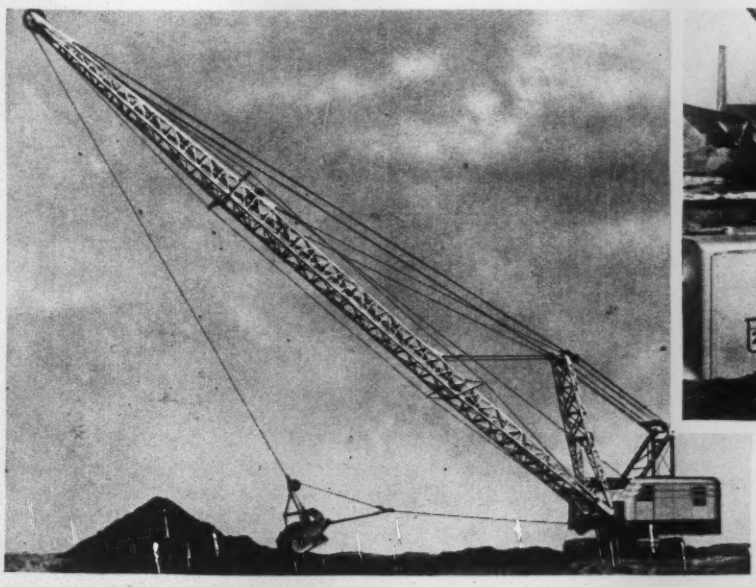
Crawler Shovels and Draglines

Harnischfeger Corp., Milwaukee, Wis.

The P&H Model 255 (illustrated) is a new high-speed ¾-yd. excavator introduced just a year ago. Much of its success is attributed to the new P&H high-leverage drive, employing the principle of high horsepower transmitted through a small clutch operating at high speed and at low pressure on the clutch disk. This is a fully convertible machine of P&H rolled alloy steel, all-welded construction throughout, combining light weight with strength. It is equipped with three-speed transmission, chain drive, chain crowd and the P&H tractor-type crawler. The Model 955-LB dragline (illustrated) is now equipped with a 100-ft. aluminum boom and 1½-yd. bucket to meet the demands of large-scale western earth-moving operations. The boom is fitted with a stiffleg gantry, which keeps its weight down, and practically eliminates bending. The machine, weighing 148,000 lb., is powered by a Fairbanks-Morse diesel engine, and is fitted with long crawlers 36 in. wide. Other new model P&H machines include the 1055 excavator, a ¾-yd. rig, and the 1055-LC 3-yd dragline. These big machines are easy to operate, through controls which are conveniently placed and respond instantly. The dragline carries the new P&H swiveling fairleads, assuring direct-line pull.

Bay City Shovels, Inc., Bay City, Mich.

Early last year, Bay City introduced a light ½-yd. full revolving convertible shovel, Model 25, which has met with wide acceptance and is reported to be turning out remarkable performance for a light machine of this capacity. This machine (illustrated) while weighing only 12½ tons, has a high crane rating and follows heavy-duty construction throughout, employing unit cast nickel manganese lower car bodies and revolving table. Reduction of dead weight while still retaining all the advantages of one-piece steel castings is achieved by the use of alloy steel. The machine is fully equipped with anti-friction bearings and helical gears. An electric dipper trip on the shovel adds from 10 to 15 per cent to the output. Chain crowd is standard on all Bay City machines; an automatic chain adjustment is a feature.



P&H No. 955 LC Dragline (above); Bay City Model 25 Shovel (upper right); P&H No. 255 Shovel (right).

Bucyrus-Erie Co., South Milwaukee, Wis.

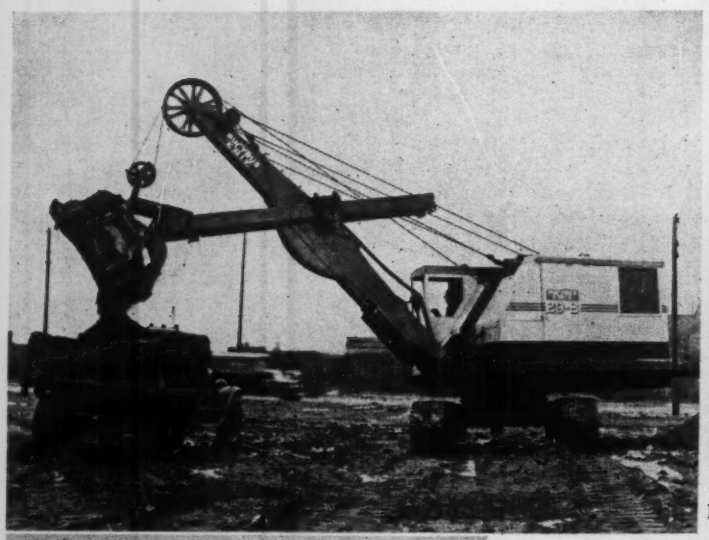
Three new shovels and two draglines have been introduced by Bucyrus-Erie in the past year. The 20-B shovel is built to give big output at low cost. Its working weight is 37,100 lb.; it travels up to 1.96 miles per hour, swings 4¾ r.p.m. and has an independent rope crowd. 20-B is available in diesel, gas or electric power. The new 18-B shovel (illustrated) is a light-weight rig with heavy-duty strength, fully convertible with all types of front end equipment available. It weighs 32,200 lb., and is powered by gas, diesel or electric motor, swings on conical rollers and is equipped with automatic lubrication and interchangeable clutches. The 29-B shovel (illustrated) is a fast 1-yd. excavator with every pound of excess weight stripped from its front end to give digging and swinging speed. This and other weight reductions are made possible by the use of welding, special steels and improved design at no sacrifice of strength. The rig weighs 65,500 lb., and is convertible to a crane of 16 tons rating at 12-ft. radius. In the 22-B Bucyrus-Erie offers a dragline and crane in which weight distribution gives increased stability in proportion to total weight, ample bearing area provides for working on soft footing, and higher speeds increase output. It has a swing speed of 4¾ r.p.m., is electric, gasoline or diesel powered and operates on long, wide treads. The Bucyrus-Monighan 3-W dragline is a companion to the well-known 5-W machine. It has a long working range, 3-yd. bucket on an 80-ft. boom or a 2½-yd. on a 90-ft. boom.

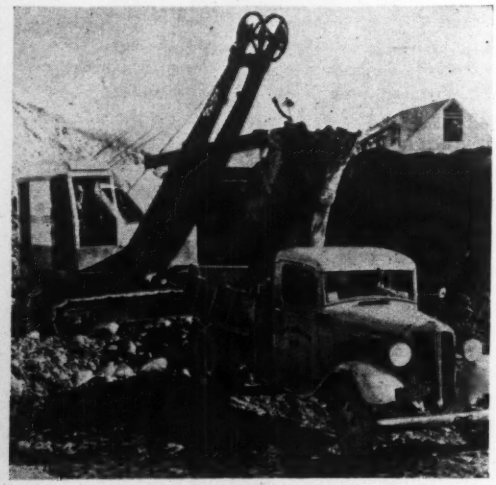
Thew Shovel Co., Lorain, Ohio

Just announced is the Lorain 79, a newly designed 1½-yd. convertible shovel, crane, dragline and back-digger (illustrated). It is mounted on a new type chain-drive crawler with 24-in. tread, also available in 28-in. and 34-in. widths. Travel speeds are ¾ and 1½ mi. per hour in either direction. The rugged structural frame is assembled largely by welding. Operating mechanism is protected by an oil-tight gear-case, and all bearings in the propelling mechanism have pressure lubrication through centralized grease leads. Idlers on the crawler frame have been replaced with a full-length T-rail upon which the tread plates ride. The rig steers in either direction, and is equipped with locking devices for work on sloping ground. Power is taken from a 6-cylinder diesel engine through the Thew center drive mechanism. The shovel boom, 23 ft. long, is made up of two rectangular-tube side members, all welded into an integral unit, and handles a 1½-yd. bucket. Crane and dragline booms are available, as is also a 24-ft. tubular backdigger boom with backhoe bucket.

Koehring Co., Milwaukee, Wis.

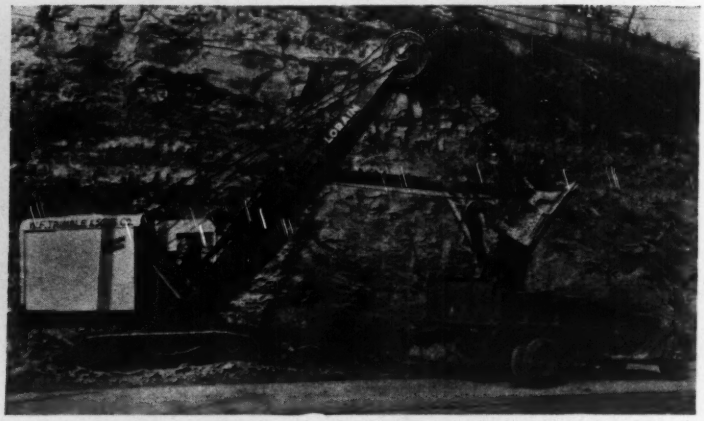
The Koehring 702 shovel (illustrated) has been developed for stripping operations. It has an extra long boom, 33 ft., and a 27-ft. dipper stick, which facilitates getting rid of the dirt, so essential for stripping operations. Several of these machines are already in operation in Ohio coal-stripping projects.





Bucyrus-Erie 18B Shovel.

Bucyrus-Erie 29B Shovel (left).



Koehring Model 702 Shovel.

Thew-Lorain 1½-yd. No. 79 Shovel (right).

Marion Steam Shovel Co., Marion, Ohio

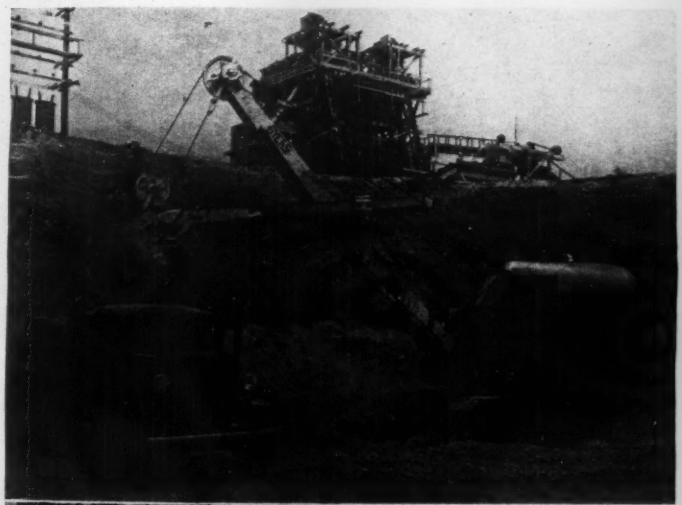
Marion now has a complete line of shovels from ¾ to 2½ yd. Type 331, a ¾-yd. improved shovel, is built for highway construction, sand and gravel pits and similar operations where a machine of less than 1-yd. capacity is needed. It is readily converted from a shovel to a pullshovel, crane or dragline. Type 342 (illustrated) is a new 1-yd. versatile machine for heavy-duty work. It is convertible to dragline, crane or pullshovel and incorporates many modern features of design and construction, built for speedy operation. Type 352 is an improved 1¼-yd. machine incorporating three outstanding developments (dragline illustrated). These are: Velvo-grip hoist and crowd clutches, vacuum-controlled dipper trip, and vacuum-controlled rotating clutches. It is a convertible machine, with a travel speed of nearly 1 m.p.h. and a rotating speed of 3.74 r.p.m. All Marion shovels and the Type 40A dragline, built especially for dragline service, have propelling gears sealed against dirt, conveniently arranged operating levers, large-diameter clutches and anti-friction bearings at all major points. The shovels have independent chain crowds.

Byers Machine Co., Ravenna, Ohio

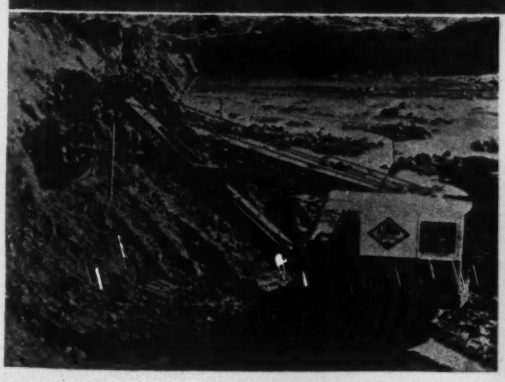
Byers' ¾-yd. Model 83 shovel (illustrated) was brought out just a year ago. Rolled-steel construction, electrically welded, and arrangement of the machinery all behind the center pin reduce the weight without affecting durability. This 36,000-lb. machine, adaptable to all attachments, has a single-line pull of 11,000 lb. at 175 ft. per min. Power is supplied through a 72-hp. gas or diesel engine by a silent chain drive from motor pinion to jackshaft, and direct drive from the jackshaft to swing, hoist and crowd-propelling shafts. The shovel carries an 18-ft. boom and 14-ft. dipper stick. Crowd is optional in chain or cable, and the shovel can swing while it travels. Model 83 fills in the Byers line of four sizes from ⅜- to ¾-yd. sizes.

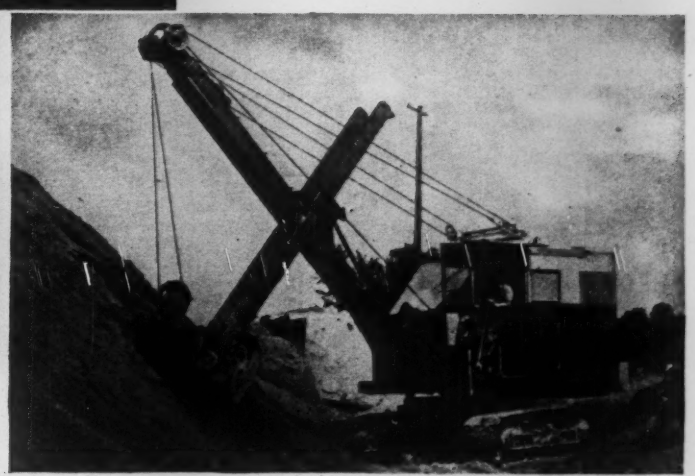
Lima Locomotive Works, Lima, Ohio

Last April Lima announced its Paymaster (illustrated), a new ¾-yd. combination shovel, dragline and crane. As a shovel, it weighs 35,500 lb., and is reported to be speedy with ample strength to give dependable service in all work suited to a machine of its capacity. When equipped as a crane the capacity is 11 tons, but when equipped as a clamshell or dragline the capacity is determined by the length of boom and class of material handled. As a shovel it is equipped with an 18-ft. boom and 15-ft. dipper stick. The standard crane boom is 35 ft. long, but inserts may be added to extend the length to 50 ft. Modern welded construction is a feature of the machine, and the boom is of all-steel box type construction. Standard crawler treads are 22 in. wide, but 30-in. treads are available, and all treads have six-point connections. The power takeoff consists of a multiple-roller chain operating in a bath of oil which assures continuous and efficient lubrication. The truck has a lock for locking both crawlers.



Marion 352 Dragline.
Byers No. 83 Shovel (left).





Lima ¾-yd. Paymaster Shovel.
Marion 342 Shovel (right).

American Hoist & Derrick Co., St. Paul, Minn.

The newest American shovel is the Model 375 American Gopher, a ¾-yd. rig. Embodying a number of new features, the Gopher is speedy, versatile and handles like an automobile. Correct distribution of weight insures perfect stability. It is a fast traveler, and is convertible to a shovel, crane, or dragline.

Speeder Machinery Corp., Cedar Rapids, Iowa

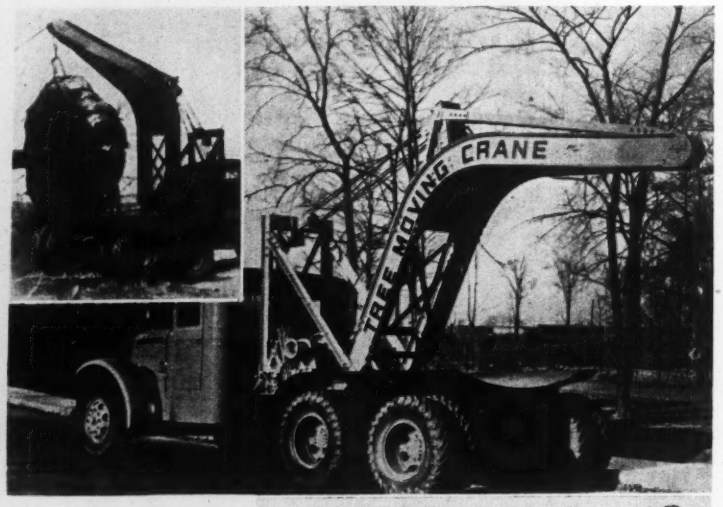
Two new power shovels, designed to deliver continuous full-capacity performance under the toughest conditions, have been introduced by Speeder. The Model LS80 (illustrated) is a new 80-hp. ¾-yd. shovel introducing new features of safety, balance and durability. All mechanism is behind the large center quill, minimizing need for dead balance. It has hooked rollers and a double-track alloy steel turntable to absorb tipping load. Selective gearing gives two travel speeds of 0.85 and 2 m.p.h. Double tubular dipper sticks with positive chain crowd insure power and accuracy in shovel work. The Model 60 is a new ½-yd. shovel built with extra strength throughout so that the operator can take full advantage of the reserve horsepower. Features are a simplified design, long crawlers and large turntables. Both models are powered by oversize gasoline or diesel engines and include such features as special alloys, inclosed chain and direct-spur gear power transmission, oversize clutches and brakes, center-mounted drums, electric welding throughout the upper frame and crawler base, and self-locking worm-geared boom hoist designed particularly for safe operation.

Buckeye Traction Ditcher Co., Findlay, Ohio

Metered vacuum control and a new type of crawler treads are features of the Buckeye Clipper line of convertible excavators (illustrated). The improved line of shovels includes the ½-yd., ⅝-yd. and ¾-yd. sizes. A feature of the improved crawler is freedom from clogging, accomplished by placing a single lug in the center and wide roller tracks on each side of the lug. The manner in which the treads fold around the teeth on the sprockets eliminates rubbing of socket teeth in or out of engagement. This keeps the wear on the teeth confined to drive pressure, and relatively high speed travel is possible without excessive noise. The new crawler tread is now standard on all Buckeye Clipper excavators.

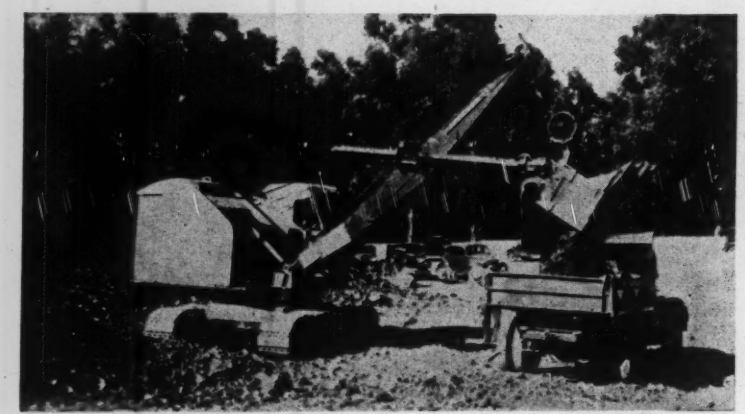
Gar Wood Industries, Inc., Detroit, Mich.

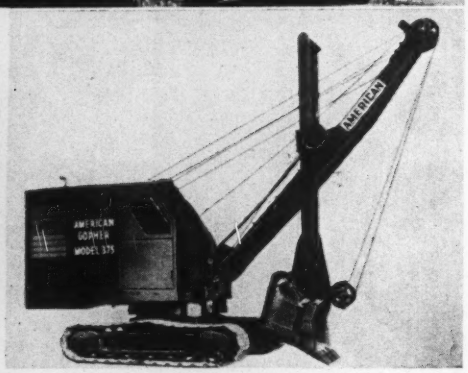
The Mead-Morrison Division has developed a goose-neck type crane for moving live trees (illustrated). The crane will handle a 45-ft. tree which, including the ball of earth around its roots, weighs about 9 tons. In operation, one of the double drums handles the boom, the other drum line is fastened to the trunk, while the single drum line lifts the root end, sliding the root into a cradle on the crane. All drums may be operated independently. The crane is widely used in highway clearing operations where the trees must be saved and in municipal park work where landscaping is a major task.



Buckeye Clipper Shovel.

Gar Wood Tree Crane (right).





American Gopher Shovel.

Speeder ¾-yd. LS80 Shovel (left).

Truck Shovels and Cranes

Bay City Shovels, Inc., Bay City, Mich.

Bay City has met the demand for a heavier truck-mounted shovel with its new Model 18 unit (illustrated) rated at ¾ yd. as a shovel and 16½ tons as a crane. It is full revolving, designed for mounting on a truck of gross rating of 50,000 lb. and equipped as a six-wheeler with dual drive. The upper revolving turntable and large roller path with internal ring gear are of unit-cast nickel manganese steel. Other features include liberal use of anti-friction bearings, helical gears, external contracting band-type clutches and brakes, swing locks, electric dipper trips, and self-locking boom hoists.

Harnischfeger Corp., Milwaukee, Wis.

The new P&H Model 250 truck crane (illustrated) has proved popular for structural steel erection. This truck crane includes many standard operating features found in the P&H line of crawler-mounted excavators, one of the most important of which is the double safety boom hoist of the planetary type, with positive lowering control to prevent dropping of the boom.

Michigan Power Shovel Co., Benton Harbor, Mich.

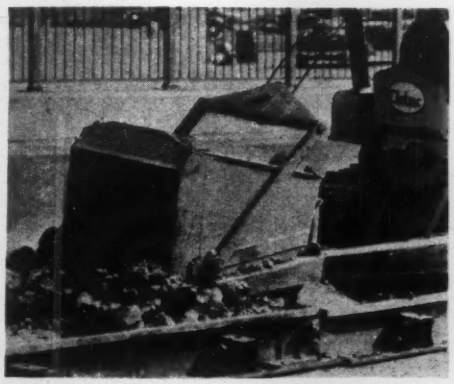
The improved Michigan truck crane (illustrated) is designed to facilitate pile driving with drop hammers. This is made possible by the hoist speed of 180 ft. per min., which permits rapid hammer strokes.

Maine Steel, Inc., So. Portland, Me.

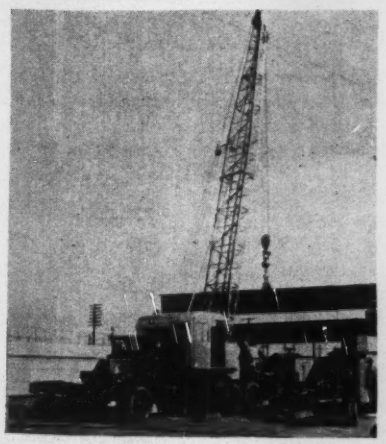
The Sargent Overhead Shovel is a new tractor-mounted rig for moving earth or for loading coal or snow. For digging it is equipped with a ⅜-yd. bucket, but larger sizes are provided for lighter materials. It is not necessary to turn the tractor to load into trucks. When used as a dirt shovel, it is equipped with a cast alloy steel bucket which crowds by backing of the tractor. When filled, the bucket is hoisted straight up and over the tractor and dumped in front by tripping a hinged cover; it can load into high trucks. One man operates both the tractor and shovel, and a digging rate of four buckets a minute can be maintained. The illustration shows this shovel digging up a macadam road without scarifying. A bulldozer blade with down pressure can be hooked on to the shovel in a few minutes and it can be changed into a snow loader in half an hour. The machine can be used as a tractor without removing any of the accessories.

Trackson Co., Milwaukee, Wis.

The new heavy-duty High Shovel (illustrated) is regularly equipped with a ¾-yd. bucket, but larger ones are available for handling light materials. To increase further the usefulness of this rig, the bulldozer or angle grader attachment can be readily installed in place of the standard bucket.

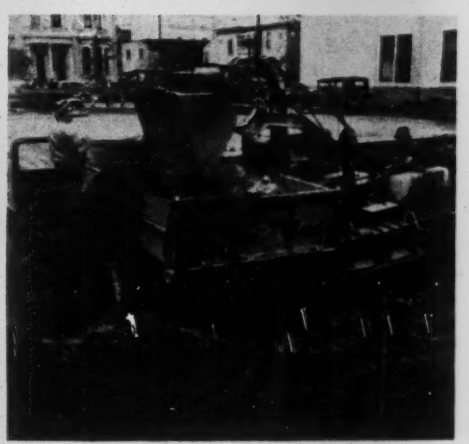


Bay City Truck Crane



P&H Truck Crane

Sargent Overhead Shovel (top).



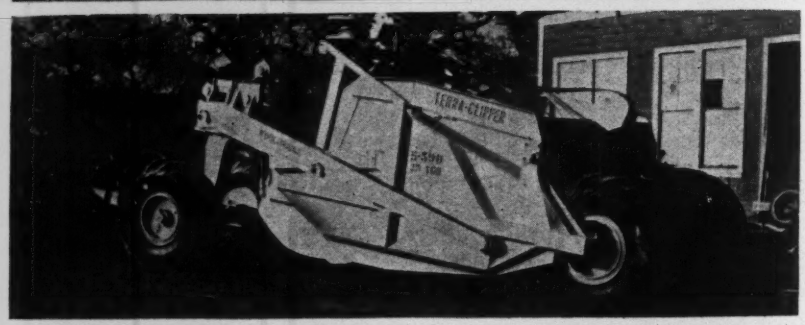
Trackson ¾-yd. High Shovel.

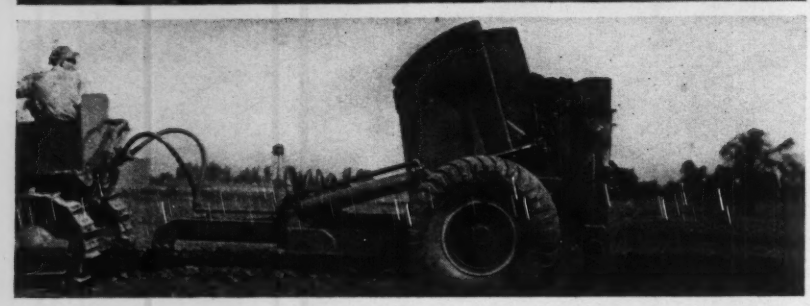
Michigan Power Shovel (left).

Carrying Scrapers

R. G. LeTourneau, Inc., Peoria, Ill.

To meet the need for high-speed travel for large earth-moving units, LeTourneau has developed a new type of tractor, the two-wheeled Tournapull, powered by a 160-hp. Caterpillar diesel engine. The engine extends unsupported in front of two drive wheels, equipped with 24-in. tires, 80 in. high. The weight of the overhanging motor is counterbalanced by the weight of the carrying unit and the load in the rear. The machine will travel with full loads up to 21 m.p.h. Two interchangeable hauling units have been designed for the Tournapull—the Tournatrailer and a new large Carryall scraper. The trailer is a 30-yd. rear dump buggy consisting of a bottomless body sliding over a fixed bed. The second unit is the U-type, double bucket, 30-yd. Carryall scraper. This machine (illustrated with a Tournapull) requires a pusher tractor to aid in loading. Controlled cutting and spreading are secured through cable action of the power control unit, and in dumping, loads can be spread to any depth up to 24 in. The scraper rides on two 24x32-in. tires in the rear and four 18x24-in. tires on the front. LeTourneau has also just developed the Model Z scraper, designed for utility road jobs and country work. This has a 4-yd. Carryall scraper mounted on four wheels all within the width of the scraper blade, so backsloping, ditch digging, canal cleaning and cutting to close grade are simple operations. Like all LeTourneau equipment, it is cable operated.





Oshkosh-Southwest Tractor and Scraper Unit (top).

Wooldridge Terra Clipper Scraper (next to top).

LeTourneau Tournapull with RU-30 Scraper (next to bottom).

Baker Hydraulic Scraper (bottom).

Baker Mfg. Co., Springfield, Ill.

The Model 210, a 5-yd. two-wheel hydraulic scraper (illustrated), is the latest in the Baker line of carrying scrapers. Announcement of this machine followed shortly after that of the Model 190, a 2½-yd. scraper. Features of both scrapers include flat digging angle, automatic rear clearance, tapering pan and down pressure on the cutting edge. The pan loads at the rear first, with less crowding necessary to fill the front end. The flat digging angle remains practically constant regardless of depth of cut, insuring even grades. The Model 210 has a cutting width of 5 ft. 4 in., cuts a maximum depth of 8 in., and weighs 6,200 lb. A new model 8-yd. hydraulic scraper, four-wheel type, embodying the same principles employed on other models, will be shortly announced by Baker.

Austin-Western Co., Aurora, Ill.

Two new models, 6-yd. (illustrated) and 8-yd. sizes, have been added to the Austin-Western line of small single-line controlled scrapers. These new machines are designed along the same lines as the 5-yd. scraper brought out some time ago. They are mounted on four wheels (six pneumatic tires) and the cutting edge is steady because the rear wheels track inside of the cut on firm ground. Each scraper, with ample pan clearance, can dump near the edge of a sharp drop without losing time to stop or back up. On fills they finish the work to grade. The 6-yd. size weighs 8,300 lb., has a cutting length of 6 ft., cuts to 12 in. deep and spreads to 18 in. high. The 8-yd. size weighs 13,750 lb., has a 7-ft. cutting edge, and cuts and fills to the same tolerances as the smaller machine.

Wooldridge Co., Sunnyvale, Calif.

The Terra-Clipper, a 25-yd. carrying scraper, weighing 30,000 lb. and equipped with either six- or eight-wheel mounting, has been put on the market by Wooldridge. It is operated by a 95-hp. tractor and a two-drum cable-control power unit. A unique provision for tandem operation permits removal of the front truck section and mounting the lead yoke of the rear scraper directly on a booster bracket of the former unit. In tandem hookups a booster tractor is required for loading the scrapers.

Oshkosh Motor Truck Co., Oshkosh, Wis.

Cooperating with the Southwest Welding & Mfg. Co., Alhambra, Calif., Oshkosh has developed a new high-speed scraper unit known as the Oshkosh-Southwest four-wheel drive earth mover (illustrated). This unit is a 14-yd. carrying scraper hooked to a four-wheel drive, four-wheel steer (air-powered) diesel drive tractor with speeds up to 35 m.p.h. It has twelve speeds forward and three reverse, full-floating axles, herring-bone drop case with an automatic-locking center differential. The tractor applies full power to all four wheels regardless of position or angle of wheel. Load distribution is such that approximately the same weight is applied to each of the four tractor wheels. Hydraulic air-actuated brakes operate on all four tractor wheels as well as on the scraper wheels.

Koehring Co., Milwaukee, Wis.

The streamline trend has reached the lowly scraper, as can be seen by the illustration of the new Koehring Wheeler, shown on this page. This is an 8-yd. carrying scraper powered by a Koehring rubber-tired tractor, and hauls full loads up to 18 or 20 m.p.h. The tractor is the same as used for the Koehring Trail Dump, and wheeler units and dump wagons are interchangeable to the tractor. A push tractor is utilized with the Koehring Wheeler to aid in loading; this same push tractor can serve a fleet of the scrapers. The speed of the hauling tractor can be synchronized with that of the pusher. The new Wheeler is designed to travel over rough ground or smooth highways.

Bucyrus-Erie Co., So. Milwaukee, Wis.

Two new 8-yd. scrapers have recently been developed by Bucyrus-Erie. Model M-81 (illustrated) is a four-wheel machine, designed to operate with the new International TD-18 TracTracTor. This scraper features the double curve cutting edge developed on the smaller B-E scrapers. The weight is 12,800 lb., and it has a cutting edge length of 7½ ft. Another B-E scraper designed for use with the same tractor is the new two-wheel Model H-74. All scraper operations are controlled by one lever which regulates a pump and heavy twin jacks. The scraper dumps backward like a truck and enables the operator to stack the load or bulldoze it to a level fill. This smaller model scraper has a cutting edge 6 ft. long.

Gar Wood Industries, Inc., Detroit, Mich.

A new improvement on the Gar Wood line of hydraulic scrapers is a spring-lift mechanism (illustrated) which prevents the tractor stalling with resulting loss of time during digging operations. The springs are compressed when digging begins, and when the load increases and the tractor starts pulling hard, the cutting edge of the scraper snaps out of the ground. The springs,

Austin-Western 6-yd. Single-Line Scraper.

Koehring 8-yd. Wheeler.

Gar Wood Scraper with Spring Lift Attachment.

Bucyrus-Erie Model 81 Four-Wheel Scraper.

without consuming any tractor power, instantly reduce the cutting depth and relieve the drag of the tractor, thus leaving all of the power for pulling the scraper and preventing stalling. The spring lift is now being furnished with the 6-yd. and 8-yd. Gar Wood scrapers, as well as on this company's larger hydraulic scrapers.

Bulldozers

Trackson Co. Milwaukee, Wis.

The new Trackson Anglefiller (illustrated) can be used in connection with the standard Trackson Pipe Layer, thereby increasing its facility for pipeline construction. The Anglefiller has been designed for a great variety of jobs, including right-of-way repair work, short-line construction, building gathering lines and laying short loops and laterals. The blade is adjustable for bulldozing straight ahead or at an angle to either side, and the operations of raising and lowering the blade are controlled by a finger lever.

Bucyrus-Erie Co., Milwaukee, Wis.

A larger size Bullgrader and Bulldozer have been designed by B-E for use with the new International TV-18 Trac-Tor. The standard specifications for the Bullgrader, which also comes in a wide-tread size, are blade length 11 ft. 7½ in., blade height 34¾ in., blade tilt 15 in., lift 36 in., drop below ground 12 in. The Bulldozer has a standard blade length of 9 ft. 2 in. The attachments weigh 7,700 lb. and 7,200 lb. respectively.

Maine Steel, Inc., South Portland, Me.

The Sargent bulldozer (illustrated) has been designed to attach to a tractor in connection with the Sargent overhead shovel. The bulldozer blade is attached by inserting four connecting pins. Down pressure can be applied to the blade, backed up by the total horsepower of the tractor, and the blade can be lifted 26 in.

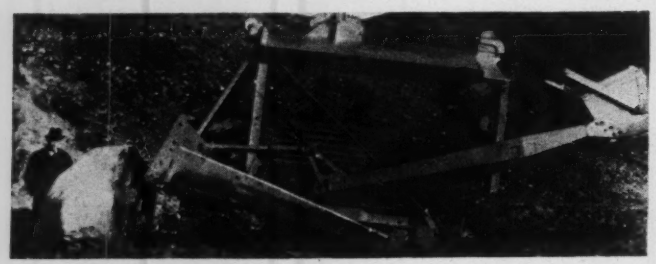
Graders and Planers

Buckeye Traction Ditcher Co., Findlay, Ohio

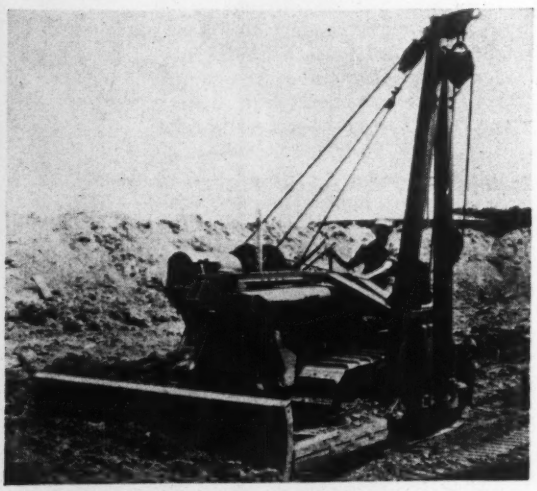
The RB power Fine Grader has been developed to fill a need for final preparation of highway subgrades. The Fine Grader (illustrated) removes all loose dirt from the grade by a series of flights on an endless conveyor, and the waste is spilled to the shoulders out of the way. Final smoothing blades trim the subgrade to exact cross section, leaving it hard and firm. When dirt is too high or too hard to be moved in one cut, the machine can be raised with hydraulic lifts to a point where it can handle a cut, and can then be reversed and lowered to proper grade to continue with the final cut. It is self-propelled, of all-welded construction, and through steering clutches can negotiate curves. Elevator frames are collapsible to clear side obstructions.

Austin-Western Co., Aurora, Ill.

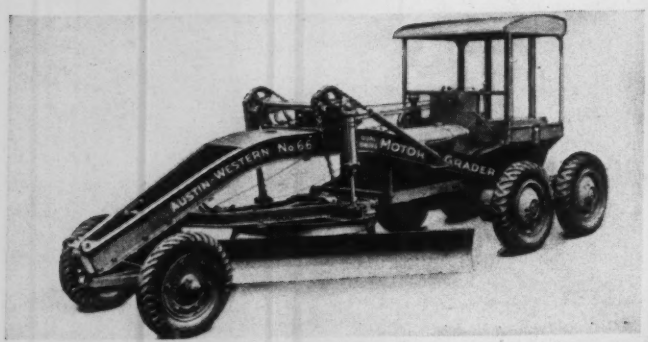
Austin-Western has two improved motor graders, the No. 66 (illustrated) and the No. 77, and a new model, the No. 99. The 66 and 77 drive through dual rear wheels, are hydraulic-controlled and carry blades 12 ft. long. The new 99 drives and steers on all four wheels, and now comes equipped with 13.5-in. low-pressure tires. It has a 10-in. box frame, a 13-ft. blade, and is powered by either gas or diesel engine. The four-wheel steering mechanism gives the machine unusual flexibility in operation and, as power is applied to all four wheels, the power load is distributed equally to all driving wheels.



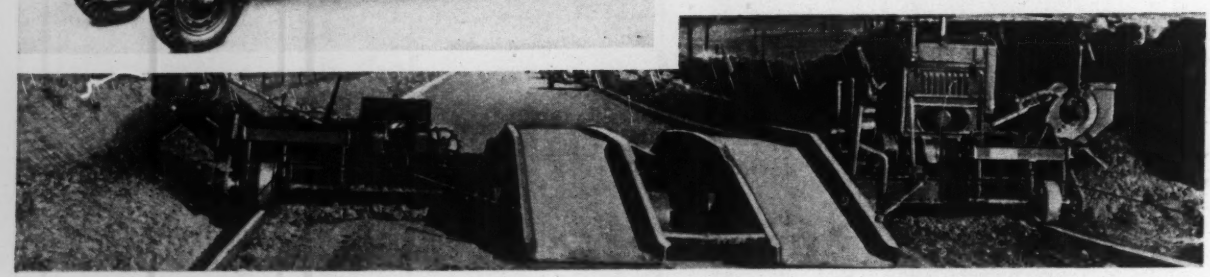
Sargent Tractor Shovel Bulldozer.



Trackson Anglefiller.



Austin-Western No. 66 Motor Grader (left).



Buckeye R-B Subgrade Finegrader.

Caterpillar Tractor Co., Peoria, Ill.

The new Caterpillar No. 12 Auto Patrol grader (illustrated) is powered by a 6-cylinder diesel engine. The engine weight is directly over the driving axle, and low-pressure tandem tires are standard equipment. The blade can be swung from ditching to bank cutting in less than a minute without the operator leaving the platform. The No. 12 has six forward speeds, top of which is 6 m.p.h. The Caterpillar Co. has just announced a new scarifier tooth with renewable point and stronger shank for all Auto Patrol models and most models of the Caterpillar blade graders. A hammer is all that is needed to put the points on or to remove them.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

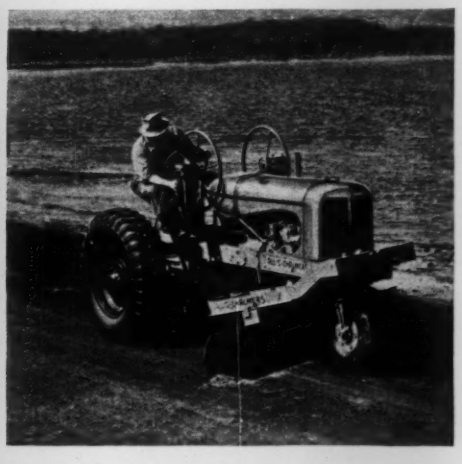
Newest in the Allis-Chalmers' line of graders is the Speed Maintainer, a high-speed unit consisting of a medium-size rubber-tired wheel tractor with a 9-ft. blade mounted perpendicular to and in the approximate center of the wheelbase. This is a one-man unit, and the operation of the blade is controlled by two large hand wheels. The blades can be adjusted to any angle by changing two bolt positions. The Maintainer has forward speeds from 2½ to 9 m.p.h., and a reverse speed of 2 m.p.h. The power plant is a heavy-duty 4-cylinder engine fitted with removable cylinder liners and valve seat inserts. Either gasoline or distillate fuel can be used.

J. D. Adams Co., Indianapolis, Ind.

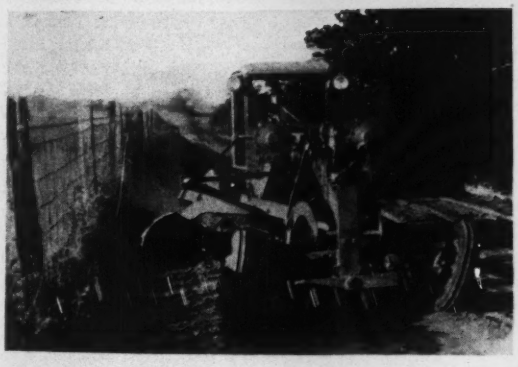
The Model 302 motor grader is a new machine just developed by the Adams Co. It is designed not only to handle road-surface work, but ditching, bank-cutting and backsloping as well. The machine is powered by an International 45½-hp. gas engine, and standard equipment includes 12-ft. blade, wheel brakes, governor control, and straight-wheel front axle. Tandem drive or two-wheel drive can be furnished as ordered, and scarifier, leaning front wheels, electric lights, starter, snowplow and other equipment are optional. Completely equipped it weighs 16,625 lb. All operations are power controlled.

Heltzel Steel Form & Iron Co., Warren, Ohio

Heltzel offers two new machines for operation on the highway subgrades. First is the sub-grade planer, available in lengths from 10 to 20 ft. at 2-ft. intervals, each length being adjustable up to 24 in. longer (illustrated). The front blade is an integral part of the wheel assembly and automatically takes up the space cleared by the increased width of the machine. Usually the larger planers are attached to the paver; as the paver progresses the subgrade is automatically planed just before the concrete is poured. The smaller unit may be attached to a tractor, truck or roller. The second machine is the sub-grade tester, a companion unit to the planer, incorporating the same adjustable features for width. (Illustrated). The tester rides on the forms, and carries a set of scratch pins that are set to the desired cross section and crown.



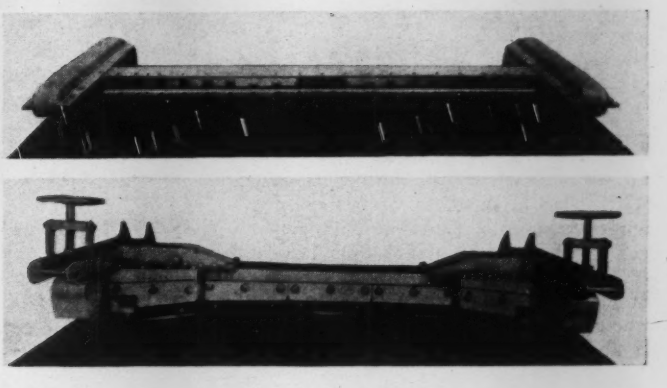
Allis-Chalmers Speed Maintainer.



J. D. Adams Motorgrader.

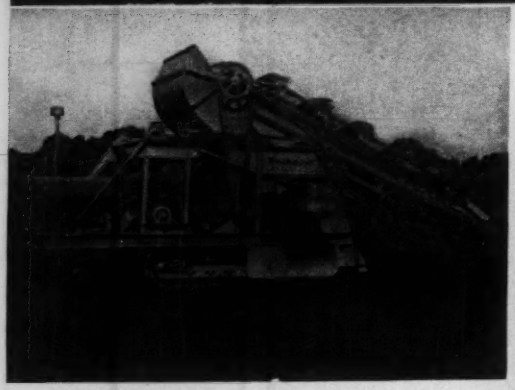
Caterpillar No. 12 Diesel Auto Patrol (top).

Heltzel Adjustable Subgrade Tester and Heltzel Adjustable Subgrade Planer (below).



Eimco Mucking Machine.

Buckeye Highway Widening Machine (upper right).



Buckeye Model 120 Ditcher.

Gardner-Denver Mucking Machine (right).

Excavators and Loaders

Buckeye Traction Ditcher Co., Findlay, Ohio

To meet the need for an excavator in widening old roads, Buckeye has developed the Model 16-R Highway Widening Machine (illustrated) mounted on a 1½-ton Ford or Chevrolet chassis. The similar Model 16-R-4 is designed to fit on any truck having a rated capacity of at least 3 tons and a wheelbase of 168 in. or more. The machine will dig a trench from 12 to 48 in. wide at one cut, working right up to the curb or edge of the existing pavement, and leaving the subgrade clean and evenly graded, ready for the foundation of the new pavement. Another new Buckeye machine is the Model 120 Ditcher (illustrated) designed for excavating trenches in places where maneuvering close to curbs, poles, buildings and other obstructions is necessary. A feature of the ditcher is its shifting boom, which digs to the right or left or in any intermediate position. This machine will excavate a trench from 16 to 30 in. wide up to 10 ft. deep. The larger companion Model 160 will excavate up to 42 in. wide and 12½ ft. deep Both ditchers will dig while moving in reverse direction, permitting tunneling under sidewalks and digging straight down alongside of building foundations, cutting manholes or other similar work. They are of the chain and bucket type, and the chain is of new design, built up from drop-forged links with splined bushings.

Gardner-Denver Co., Quincy, Ill.

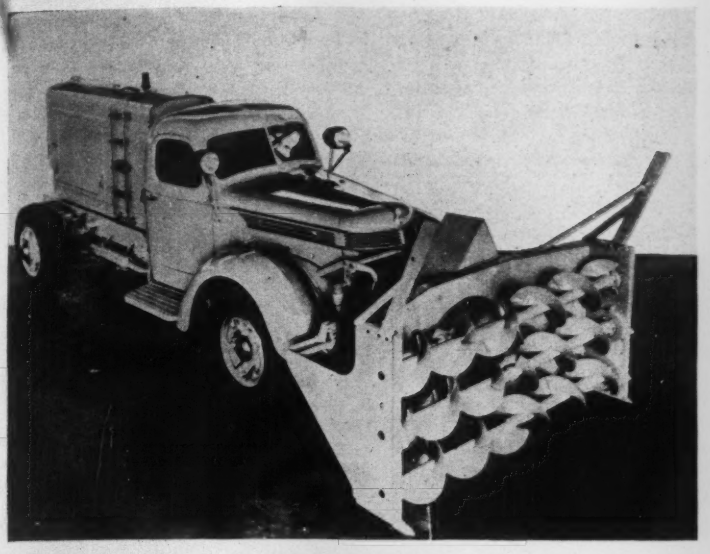
The Gardner-Denver line of mine car loaders has been adapted to tunnel work. These loaders (illustrated) are powered by compressed air motors designed for this service; one motor is used for crowd and travel, another for loading. The dipper is actuated by the pull of two cable chains, which throw the bucket upward and backward to discharge the load directly into a muck car. The loaders are built to operate on any track from 18- to 30-in. gage.

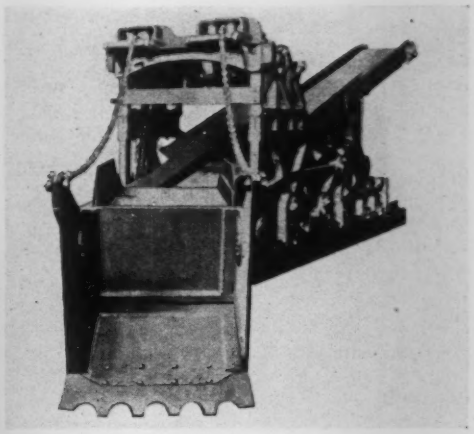
Eimco Corp., Salt Lake City, Utah

The Eimco-Finlay loaders, originally designed for mine work, have been adapted for tunnel mucking, especially the Model 20 (illustrated). The loader is operated by two compressed-air motors, one furnishing the power for propelling the machines and for crowding, the other for digging, loading, lifting and dumping. The machines dump by throwing the load back over the shovel into a waiting car.

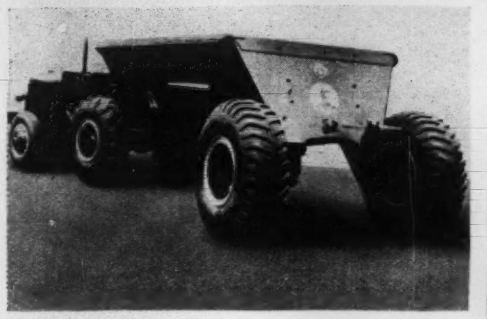
St. Louis Power Shovel Co., New York, N. Y.

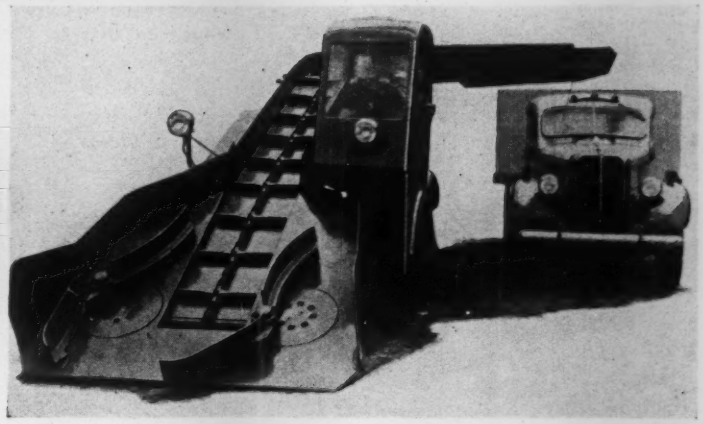
The Conway Mucker, which was widely used on the Colorado River Aqueduct tunnels, has been improved and enlarged for use on the Delaware Aqueduct tunnels for the New York City water supply project, a larger bore throughout. The principle of loading muck with a short bucket lift onto a belt conveyor for transfer to cars has been retained, but the machine has been made larger and heavier and equipped with a 75-h.p. electric motor (next page). Those on the Colorado River tunnels were 60-hp. machines. Douglas C. Corner, designer of the Conway muckers, states that further improvements, including a storage conveyor for taking care of muck without stopping while cars are switched, will soon be available. He is also developing a power control to replace the present manual control for easier and better operating, and has plans for a 150-hp. machine. Smaller machines are available for small size tunnels.





Conway 75-hp. Mucker.
Klauer Snogo Snow Plow (left).





Euclid TracTruk Wagon.
Joy Snow Loader (right).

Snow Equipment

Joy Mfg. Co., Franklin, Pa.

Joy offers a new model loader, particularly adapted for handling snow (illustrated). It is a gasoline engine driven, self-propelling and self-feeding machine of the inclined conveyor type with the patented Joy gathering mechanism. The arms feed the conveyor and clear the full width of the machine while advancing. The conveyor is mounted on an automotive chassis and provides a complete unit operated by one driver from a cab located on the left side of the conveyor immediately above the gathering head. The loader cuts a pass 8 ft. wide, and a 24-in. conveyor will discharge into trucks to either side for a distance of 10 ft. from the center line of the machine.

Maine Steel, Inc., So. Portland, Me.

For handling snow, the Sargent Overhead Shovel, mounted on a Cletrac tractor, can be equipped with a special large bucket. The special 1½-yd. snow bucket can be enlarged to 2-yd. capacity through demountable extensions. Designed to transmit the entire power of the tractor into a straight-line crowd, the shovel can dig into frozen snow that has not been loosened by picking. The shovel loads the snow directly into trucks, even those with high sideboards. This Overhead shovel can also be used effectively in tree removal work. Ultimately the shovel will be available for use with all standard makes of crawler tractors.

Klauer Mfg. Co., Dubuque, Iowa

The Klauer Model LMU Snogo (illustrated) is designed for use on the International D-50 ¾-ton truck. The lift gear and snow stream control are hydraulic with controls located inside the cab. The snow stream is controlled from the cab and can be directed either to the right or to the left. Power for the Snogo is supplied by a separate 110-hp. plant. This machine will handle any depth of snow, and will throw it as far as 100 ft. from the road.

Haulage Units

Euclid Road Machinery Co., Cleveland, Ohio

A new Euclid Model FT bottom-dump Trac-Truk (illustrated) has been designed for greater capacity and better performance through improved load distribution. The rounded capacity of this unit is 16 cu.yd., struck capacity is 13 cu.yd. The trailer body is deeper and wider at the forward end, carrying more of the load on the tractor drive wheels. The load is equally distributed to each of the four 18x24-in. tires. Another new feature of this model is the high clearance under the rear of the trailer. This Trac-Truk is available with either the Cummins 150-hp. diesel or the Waukesha 133-hp. gas engine.

Speed Dump, Inc., New York City

The new Speed Dumper is a nest of five or more 2-yd. steel buckets handled by a two-way non-reversible worm and gear-driven hoist mounted on the

rear of a truck bed. The buckets are spotted around the job as required and, when loaded, are picked up one at a time for transporting to the dump. They are dumped by tilting backward from truck bed level. Buckets can be lowered directly from the truck to bottom of trench or excavation.

Gar Wood Industries, Inc., Detroit, Mich.

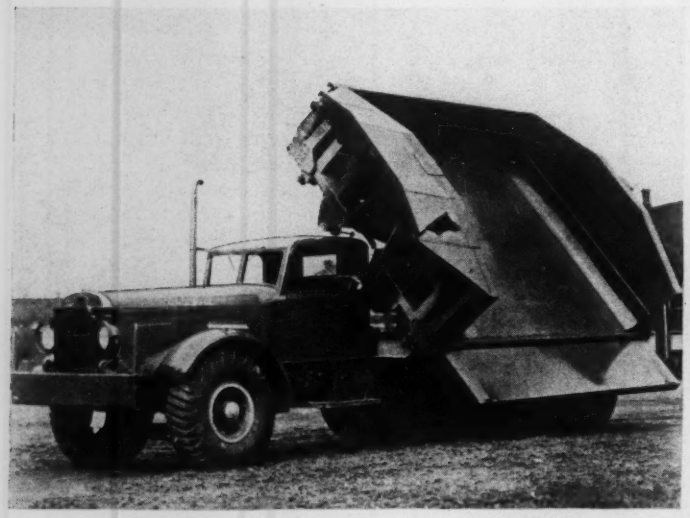
Gar Wood offers contractors a new 10-yd. dump truck (illustrated) especially designed for heavy hauling. It is equipped with automatic down-folding tailgate and a heavy cap protection canopy. The body is raised and lowered by Gar Wood T-44 dual hydraulic hoists. A larger unit is the new 16-yd. body, two-way side dump (illustrated) equipped with automatic down-folding tail gate and dual hydraulic hoists. This unit is particularly adapted to large stripping operations. A third new Gar Wood unit is the Load-Packer (illustrated) for handling garbage and refuse. It compresses, like a hydraulic baler, all kinds of bulky rubbish and garbage into a compact mass and a full-capacity 16-yd. load that weighs much more than the usual loose load of such material. The Load-Packer can be built to fit any truck or trailer chassis. The loading trough, set close to the ground, simplifies loading by shovel or from baskets and cans. The material is not exposed and odors are confined. Cleaning of the body is easy. When loading, the trough is filled and the loading doors, closed and locked, become part of the tailgate ram. Two jacks then thrust the ram and its packing plate and retainer plate against the load in the trough, pushing the material into the body. The packing plate and tailgate ram then return to loading position, while the retainer plate holds the compacted mass within the body through an automatic catch. For dumping the compact load, the body is raised by two hydraulic jacks like any dump truck.

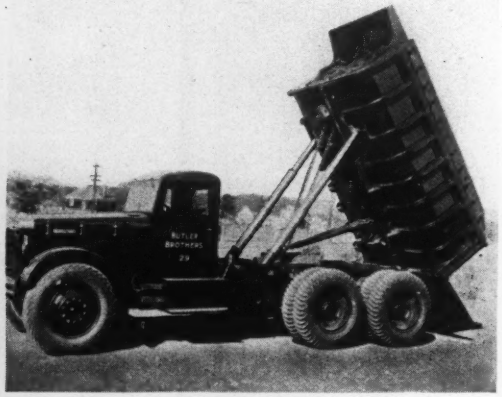
Ford Motor Co., Detroit, Mich.

A new Ford V-8 Dump Truck (illustrated) has been made available to contractors. It is mounted on a 134-in. wheelbase, and comes with either the new 95-hp. engine or the improved 85-hp. engine. There is also a choice among rear axle ratios of 5.14 to 1, 5.83 to 1, and 6.67 to 1. A two-speed axle with dual ratios of 8.11 to 1 and 5.83 to 1 can be furnished if desired. Equipped with hydraulic brakes, like all other units in the 1939 Ford V-8 line, this truck has 15x3½-in. brakes in front and 14x1½-in. brakes in the rear. The hand brake system is mechanical and completely independent.

Trojan Truck Mfg. Co., Los Angeles, Calif.

A 43-yd. truck, reported to be the largest ever built, was put into the field recently by Trojan. A special design of tailgate permits loading of the unit to maximum capacity regardless of type of material being handled. The body does not raise in unloading, but the load is pushed out to the rear by means of a sliding bulkhead in the body. This type of unloader permits spreading of the material if desired. Power for the truck is supplied by an 8-cylinder V-type Caterpillar diesel engine rated at 180 hp. The unit is mounted on





Gar Wood 10-yd. Dump on International.

Gar Wood 16-yd. 2-Way Dump on Autocar Diesel (left).

Gar Wood Load-Packer Refuse Truck.

Ford V-8 Dump Truck (right).

twelve wheels on two axles at the rear and two wheels at the front. Driving power is transmitted to both rear axles, thus all twelve rear wheels are drivers. The regular transmission has three speeds forward and one reverse, while an auxiliary transmission has overdrive, under-drive and direct drive.

Hug Co., Highland, Ill.

Hug announces the addition of three heavy-duty chain-drive models to its line of Road Builder trucks. Model 98CD is a single rear axle chain-drive model with a maximum gross vehicle weight of 60,000 lb. Standard equipment is a 10- or 12-yd. Boulder Dam type body. The Model 98MD (illustrated) is a dual rear axle chain-drive model with a gross weight of 72,000 lb., and its standard body equipment is a 16-yd. Boulder Dam type body. The largest of the three, the Model 99MA is also a dual rear axle chain-drive, has a maximum gross weight of 120,000 lb. and comes equipped with a 25-yd. Boulder Dam type body. Features include all-welded I-beam frame, front axle rocker action, setback wheel design and heavy-duty armored cowl hood and radiator guard. Air brake equipment on all wheels are standard equipment.

General Motors Truck & Coach, Pontiac, Mich.

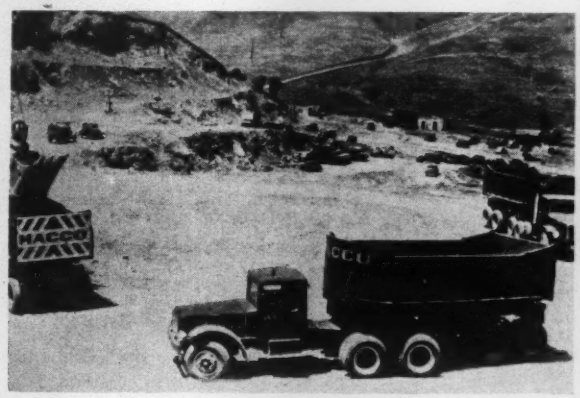
General Motors now offers the contractor a wide variety of diesel engine trucks, as GMC diesel power is optional on all GM units from the 15,000-lb. gross load vehicle to the 35,000-lb. models. This line of diesel truck engines includes three, four, and six-cylinder power plants, developing 45, 60 and 90 hp. at 1,200 r.p.m., respectively. The injectors on these diesels are so designed that each cylinder has its own injection system, combining the spray nozzle and the high-pressure fuel pump in a single unit. Fuel is supplied to the injectors under low pressure. The diesel engines are about the same size and weight as the General Motors gasoline engines that are specified for the same service.

Fruehauf Trailer Co., Detroit, Mich.

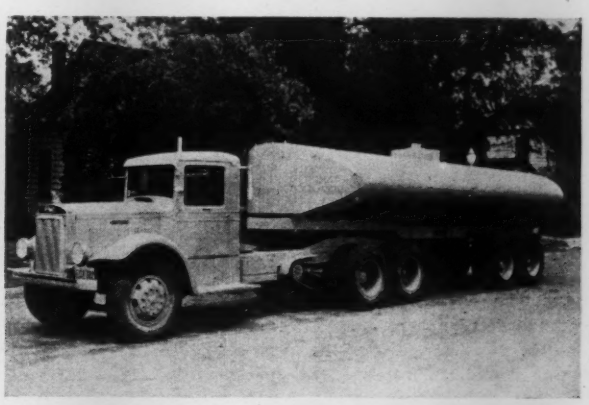
Fruehauf has three new trailer units of interest to contractors. First is the 17-yd. dump trailer (illustrated). These are tandem units with power fifth-wheels. Second is the new tandem dump trailer (illustrated) coupled to a White diesel tractor truck, designed not only for heavy hauling duty but for spreading road materials. Spreading is accomplished by means of an air-operated tailgate through which the flow of material can be regulated, permitting even spreading at constant engine feed. This unit is equipped with eight 10½-ton 24-in. tires in tandem, and standard 12-yd. dump body can be increased to 15 yd. by the use of sideboards. The third unit is a streamlined tank trailer (illustrated) having a capacity of 5,800 gal. of road oil. The unit not only hauls oil but spreads it as well. It is hooked to a Mack tractor truck and hauls a 43,000-lb. payload.

C. R. Jahn Co., Chicago, Ill.

A new all-purpose trailer, designed to transport construction machinery and other heavy loads up to 48,000 lb., has been announced by Jahn. For ease in loading, the front end of the trailer frame is designed both as a connection and as a turntable for the front axle, permitting the entire front axle assembly to be removed. Loading is also made easier by means of a heavy screw jack built into the coupling assembly. Either tandem or dual-oscillating rear-axle arrangements are available on this new trailer, and all wheels are equipped with heavy-duty pneumatic tires.

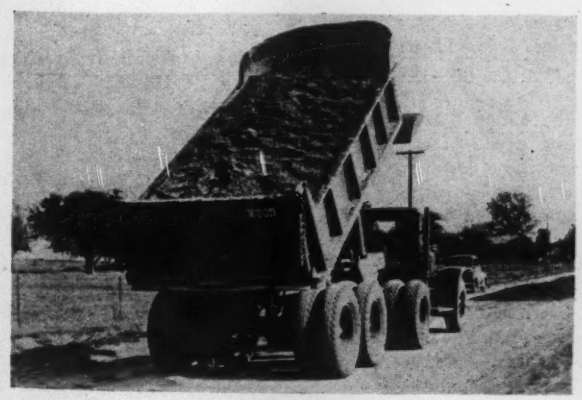


Fruehauf 17-yd. Dump Trailer.

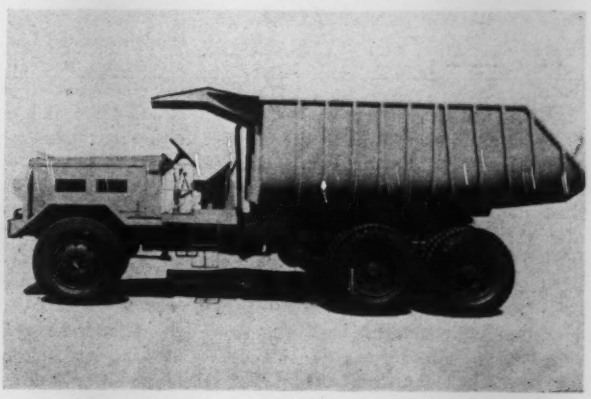


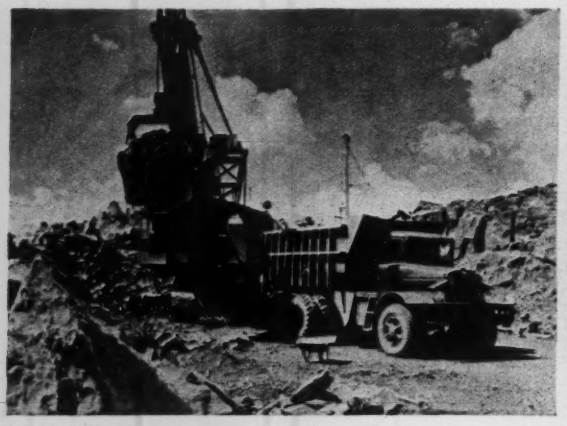
Fruehauf 5800-gal. Bituminous Spreader.

Fruehauf 12-yd. Dump Trailer.

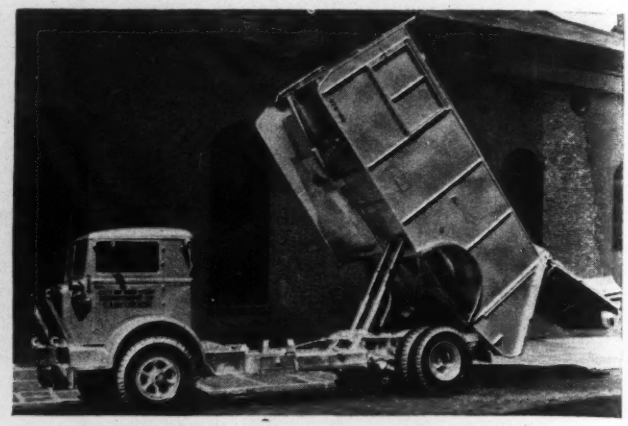


Hug 16-yd. Boulder Dam Dump Body.



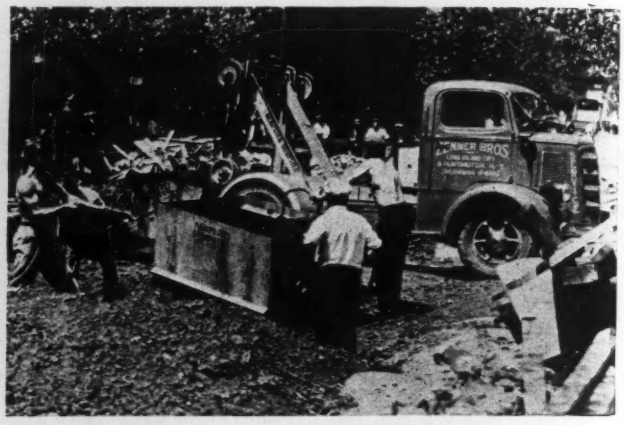


Mack Super-Duty Dump Truck.



Autocar Rubbish and Garbage Collector.

Mack Light Weight Dump Truck.



Mack Cab-Over-Engine with Dempster Dumpster Body.

Mack-International Motor Truck Co., Long Island City, N. Y.

Three new contractors' trucks have been announced by Mack. One is the Model EE (illustrated) rated at 12,000 lb., a new light-type truck for this company. The model EF, similar to the EE, is rated at 14,000 lb. These two models feature streamlined construction, six-cylinder engines, rated at 75 hp. and 78 hp., respectively, counterbalanced crankshaft and engine cylinders cast in block with detachable one-piece heads. Both models have four-wheel foot brakes of the internal hydraulic type; those on the EF are vacuum-booster actuated.

Another new line of Mack trucks is that of six new cab-over-engines models. These are rated from 12,000 to 23,000 lb. gross and correspond to the standard light-capacity and medium-capacity models. One of these new models is illustrated with the Dempster-Dumpster attachment. All models are streamlined, and the chassis of each accommodates standard body lengths on wheel bases averaging 32 in. shorter than corresponding conventional models. Due to the cab-over-engine construction, the weight distribution is one-third on the front and two-thirds on the rear wheels. All six models are powered by six-cylinder engines. Four-wheel brakes are standard and all are equipped with vacuum booster brakes. Springs are equipped with rubber shock insulators at all spring ends. Mack has also developed two new super-duty truck models designed especially for quarrying and other off-the-road operations. Of the two new models, the FC 6-wheeler is rated at 100,000 lb. (illustrated) and has a net payload capacity of 30 tons. As a 4-wheel truck, this model has a gross vehicle rating of 60,000 lb. and payload capacity of 16 tons. The other model, the FJ, is designed for 11-ton loads and is available only with four wheels. All three of these new units are chain drive and can be obtained with either gasoline or diesel power plants. Transmissions are especially designed 5-speed main boxes with two-speed integral auxiliaries and offer ten ratios from 12.75 to 1, to 0.73 to 1, in the FJ and 14 to 1 to 0.73 to 1 in the FC. These trucks are equipped with large-area air brakes with oversize rigid-type shoes and heavy block linings. The parking brake is on the driveshaft, interconnected with the air chambers on the rear, and in addition special emergency equipment is furnished whereby a failure in any of the main system lines will automatically apply to rear wheel brakes from an isolated emergency supply.

Autocar Co., Ardmore, Pa.

Autocar has come out with a new type of rubbish collector truck (illustrated) known as the Model UT, furnished on a 173-in. wheel base. Rubbish placed in the hopper at the rear is carried by an endless conveyor up into the top of the truck. The truck is dumped by raising the body to an angle of 55 deg. by means of hydraulic jacks which automatically fully raises the tailgate without disconnecting the rear loading hopper and conveyor.

Thornton Tandem Co., Detroit, Mich.

Thornton has added a two-speed axle to its big Ford-Thornton 4-wheel rear-drive truck, which gives it a gross rating of 30,000 lb. with sixteen forward speeds. The truck chassis weighs only 8,000 lb., leaving 22,000 lb. for pay load and body. The Thornton gear case assembly is mounted on the frame,

Marmon-Herrington Marsh Buggy.

Marmon-Herrington All-Wheel-Drive Contractors' Truck.

Four Wheel Drive Road Maintainer.

Four Wheel Drive 8-yd. Rock Dump Body.

not on the axles. This design permits use of a torque yoke that provides a useful flexibility between gear case and axles.

Four Wheel Drive Auto Co., Clintonville, Wis.

F.W.D. has contributed three new models to the roadbuilding field. The latest is the Model HG Road Maintainer (illustrated) designed for road blading and grading, snow removal and for heavy hauling. It is powered with a 6-cylinder, 91-hp. engine, capable of road speeds up to 33 m.p.h. A new feature is high center clearance of the chassis which gives room for an under-body grader or shaper mounting without increasing the body mounting height. With standard tires and fully loaded chassis, this clearance is 23 in. at the lowest point. The unit carries a new type of under-body blade, held in constant cutting position and under constant control by levelizers and hydraulic rams. All controls are located in the cab for one-man operation. The Model T-32 is a new F.W.D. semi-trailer for general hauling, powered by a 6-cylinder 90-hp. engine. This unit has a gross weight rating of 50,000 lb. and is equipped with two entirely independent sets of four-wheel brakes, of the vacuum booster operated hydraulic type. The third new F.W.D. unit is a special rock truck, carrying an 8-yd. water level dump body with twin telescopic hoists mounted outside the frame (illustrated). The chassis weighs 14,000 lb. and a 198-hp. engine provides a road speed up to 35 m.p.h. This unit is designed to operate over either soft or rough ground.

Heil Co., Milwaukee, Wis.

Heil has a new type of dual hydraulic lift jack for large dump bodies. This is the Straddle-Mount telescopic hoist, utilizing the Heil telescopic hydraulic jacks mounted on the outside of the frame instead of between the frame members. While this type hoist is applicable to many types of dump bodies, it is particularly adaptable to the Heil 8-yd. Boulder Dam body and the special Model SS1 17-yd. dump body. The latter body is 16 ft. long, 7½ ft. wide and is strengthened with channel side braces every 2 ft. Another new Heil unit is a hydraulic dump garbage and refuse collector, featuring a closed body with either sliding or hinged doors. The 16-yd. model, with sliding doors, has a watertight tailgate operated by a hydraulic hoist. Heil also has a line of open body garbage trucks that are available in a variety of sizes from 3½-yd. to 14-yd. capacity.

Marmon -Herrington Co., Indianapolis, Ind.

The 1939 line of Marmon-Herrington all-wheel drive trucks, includes two new models. One of these is the Marsh Buggy (illustrated) designed to travel over marshes and through deep mud. Fundamentally, this new unit is an all-wheel-drive Ford truck designed to accommodate the mounting of four to ten 13.5x24-in. tires. The tractive power required varies in accordance with the type of terrain in which the vehicle is to operate. When ten tires are required, three are supplied on either side in the rear and two on each side of front. Another new unit of this company is a Ford dump truck, equipped with all-wheel drive (illustrated), designed to traverse deep, loose dirt, sand, gravel or snow. If desired, six-wheel drive dump trucks can be furnished by adding an extra-drive axle on wheels in the rear.

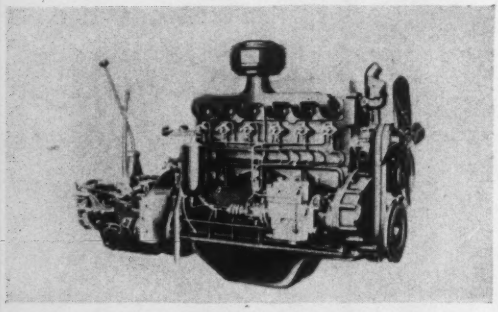
Bay City Shovels, Inc., Bay City, Mich.

A new line of trailers, designed particularly for transporting the Bay City shovels, but adaptable to any heavy hauling, has been announced by Bay City. These units (illustrated) are completely electric welded and are available in capacities up to 30 tons. They are made in six different types to meet various state laws and, except for the heavier trailer, deck and wheels have been kept within the limiting maximum width of 8 ft. for use on state highways without permit. They are made in both the deck and skeleton design, and are available with four or six wheels, with straight, tandem or oscillating rear axle. They are also available as semi-trailers, and the deck type is made with either straight or drop frame deck.

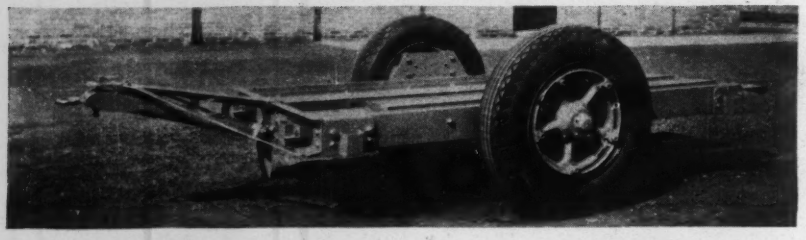
Kewaunee Mfg. Co., Kewaunee, Ill.

This firm announces a new line of high-lift truck bodies, hydraulically operated, available in two types, both the high-lift hopper body (illustrated) and the high-lift dump, the latter constructed with flat bottoms and available for various dumping angles from 30 to 50 deg. with clear dumping heights from 5 to 7 ft. The sub-frames, constructed as a unit, may be mounted on any make of truck without alteration. Hydraulic cylinders attached horizontally to this sub-frame, operate on ball cranks to translate the horizontal movement to vertical movement. The hopper-bottom model can be obtained with clear dumping heights as high as 8 ft. 8 in., and in capacities up to 10 tons. The elevated dump truck body is available in capacities up to 8 tons. Hoisting controls for either design are conveniently arranged to be operated from either cab or outside.

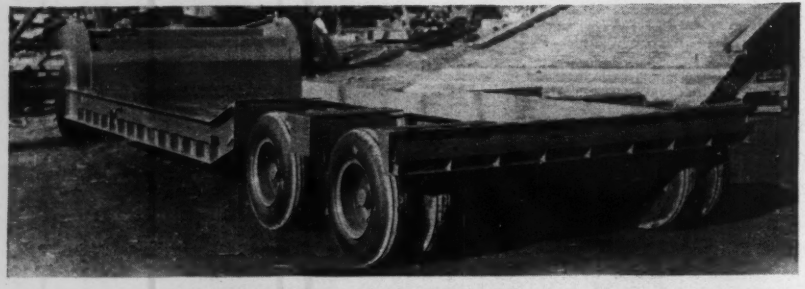
Kewaunee High-Lift Body.

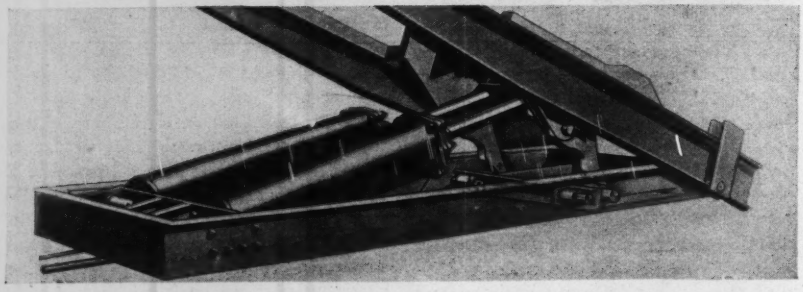


Dodge Diesel Truck Engine.



C. H. & E. 3-Ton Trailer.





Anthony Low-Loading Hydraulic Body Hoist.

Bay City Shovel Trailer (above).

Chrysler Corp., Detroit

After a decade of experimentation, Dodge Truck Division of Chrysler Corp. has announced a new diesel engine for 3-ton trucks. This engine is a full compression-ignition diesel of 331 cu-in. displacement, rated at 95 hp. at 2,600 r.p.m. It is of the 6-cylinder 4-stroke cycle type, and its general dimensions mounting and crankcase structure are identical with those of the Dodge 3-ton truck gas engines. Dodge has departed from its conventional L-head engine designs to employ overhead valves in the new diesel, and the combustion chamber is located in the cylinder head. The engine is illustrated on this page.

C. H. & E. Mfg. Co., Milwaukee, Wis.

A small two-wheel trailer unit, designed to transport construction equipment weighing up to 3 tons has been announced by C. H. & E. It can be used with any automobile, truck or tractor, and can be trailed fast with safety, due to spring suspensions preventing sidesway. As shown in the illustration, it is equipped with 7.5x20-in. tires and the draw bar is designed to permit the rear end to be dropped down as a ramp for loading.

Anthony Co., Inc., Streator, Ill.

Of interest to contractors is the new Anthony line of OK Low-Mounting Hoists for dump truck bodies. The low loading height is obtained through a telescoping of two longitudinal sills of the sub-frame and tipping frame (illustrated). The unit is available in seven different models from five to thirty tons capacity, adaptable to any make, model or wheel base chassis. Dumping is through a combination of cam arm and direct lift, the cam being utilized for the first 25 deg. when lifting power required is greatest, then direct power pushes the load up another 25 deg.

Crawler Tractors

Caterpillar Tractor Co., Peoria, Ill.

The D-2 diesel tractor (illustrated) is the latest in the long line of Caterpillar tractors. This is the smallest of the company's line of diesels, and operates on about 1¼ gal. of fuel per hour. It has five forward speeds, a hand-operated clutch and finger-tip control. This small unit is equipped with an all-cooling system and only three operating adjustments are required in the field—the water pump, valves and fan belt. The fuel injection pumps and valves are factory-set and require no attention in the field. This tractor is rated at 25½ draw-bar hp., has a four-cycle water-cooled, four-cylinder engine that is started by an independent two-cylinder gas engine. The D-2 is rated at 25.5 hp. at the drawbar and 31.5 hp. at the belt. Travel speed at full load is from 1.7 to 5.1 m.p.h.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Many large earthmoving projects today are being equipped with large-capacity carrying scrapers requiring a pusher tractor for loading. Allis-Chalmers has developed a pusher bumper fitted to either the standard or Contractors Special Type L or LO crawler tractors (illustrated). When used in connection with GarWood L-12 scrapers, fitted with bumpers, the pusher tractor engages the scraper from the rear and assists the hauling tractor in loading. The pusher bumper merely replaces the standard tractor bumper and leaves the draw-bar free. Pushing surface is a large steel plate 30x36 in. connected to the same place as the regular tractor draw-bar by means of two parallel beams. Allis-Chalmers also announces the new Model S crawler tractor (illustrated). This tractor is a companion to the older 60-hp. Model SO and is rated at the same hp. It has five speeds from 1.52 to 6.37 m.p.h., is equipped with a 4-cylinder valve-in-head engine, removable cylinder liners, inserted valve seats and full-pressure lubrication. Laboratory tests give a fuel consumption rate of 0.5 lb. of fuel per brake hp. hour.

International Harvester Co., Chicago, Ill.

The largest and latest in the International crawler tractor line is the new Model TD-18 diesel 6-cylinder Trac-Trac-Tor (illustrated). This new tractor is rated at 80 hp. at the belt and 70 hp. at the drawbar. Similar to other International diesels, the TD-18 engine is started by gasoline, and after a minute or less of operation, shifts to full diesel operation. It is equipped with a conventional automotive-type electric starter. The tractor has six forward and two reverse speeds from 1½ to 5¾ m.p.h. forward and 3¼ m.p.h. reverse. The engine is six-cylinder, four-cycle, full-diesel type. Features include clutch brake for fast gear-shifting, power actuated steering clutches, full pressure engine lubrication, track shoes keyed to track lengths, to eliminate loosening of shoes and field track rollers, gravity lubrication for track rollers at low speeds and pressure lubrication at high speeds, and unit construction by which each steering brake, steering clutch and track frame assembly can be adjusted or replaced without disturbing adjacent parts. The tractor is available in two treads, 62 in. center to center, and 74 in. center to center. The ground contact length of the tracks is 84⅝ in., and track shoes are available in a variety of sizes and types.

International Diesel TD18 Tractor.

Allis-Chalmers S Gas Tractor and A-C Grader.

Caterpillar D2 Diesel Tractor and No. 22 Grader.

Allis-Chalmers LO Tractors and Gar Wood Scraper.

Cleveland Tractor Co., Cleveland, Ohio

The most recent development in the Cletrac line is the Model F streamlined tractor (illustrated) available in 94 and 95 drawbar hp. in gasoline and diesel, respectively. The Model F has several improvements and new features, including the one-piece, drop-forged steel track shoes, the pitch of which has been shortened 1⅞ in.; a larger diameter idler wheel and drive sprocket in the track which, with a shorter pitch track, gives a longer track with corresponding increased traction; 24 grousers in contact with the ground instead of 20 as on other models, and greater width and ground clearance. The tractors weigh approximately 28,000 lb. which, with the greater grouser contact and very low gearing, permits loading of large scrapers. This model has four speeds forward up to 5 m.p.h. and two speeds reverse. Both diesel and gas engines are electric starting.

Rollers

R. G. LeTourneau, Inc., Peoria, Ill.

A different sheepsfoot roller (illustrated) in which drum sections 3½ ft. in diameter and 5 ft. long are hinged together for oscillation and easy flexibility, thus permitting the rollers to follow the contour of uneven ground, has been developed by LeTourneau. The hinging arrangement allows interchanging of any drum in the roller with any other drum. This feature permits conversion from a two-drum roller into a four-drum roller at will. Likewise, these sections can be placed in tandem where additional compaction is required. The feet are tapered in a special design for maximum compaction, and they pull out of the ground without kick or tearing up the newly-rolled material. The feet are 8 in. in length and are heat-treated and hard-surfaced.

Blaw-Knox Co., Pittsburgh, Pa.

A new design of sheepsfoot roller tamping feet that simplifies maintenance and adds service life has been announced by Blaw-Knox. Worn-out tips of the Blaw-Knox roller feet may now be renewed without replacing the complete appendages. The worn tip is burned off as illustrated, and the shank of the new tip is inserted into and welded to the hollow shaft of the old foot. This eliminates the use of the practice of burning the feet off at the drum.

C. H. & E. Mfg. Co., Milwaukee, Wis.

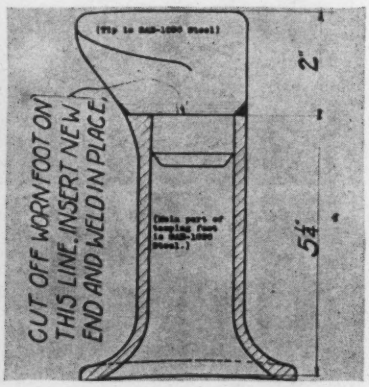
A 3-ton tandem roller (illustrated) has been developed by C. H. & E. to meet the demand for a larger roller than the standard 2-ton for blacktop construction on driveways, playgrounds, parking spaces and similar application. Weight can be varied from 2½ to 3 tons by adding water to both front and rear rollers. The roller is of all-welded steel construction and the front rolls are large to insure smoother surfacing on curves as well as easier steering. The machine will travel up to 4 m.p.h. in either direction. It is powered by a LeRoi 4-cylinder gas engine.

Sweepers

Austin-Western Road Machinery Co., Aurora, Ill.

The new Patrol Sweeper will clean any part of the pavement, but it was designed primarily to sweep the gutter area along the curb, where dirt gener-

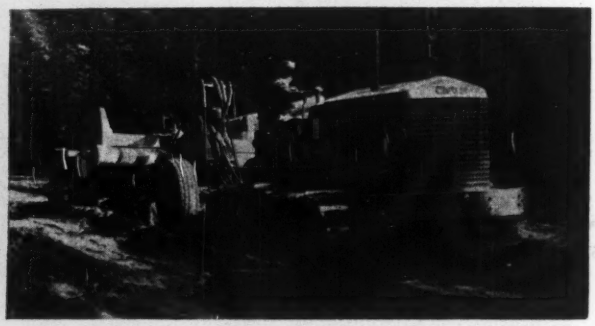
Cletrac Track Tension Adjuster.



Blaw-Knox Renewable Roller Foot.

C. H. & E. 3-ton Tandem Roller.

LeTourneau Oscillating Sheepsfoot Roller.



Cletrac FD 95-hp. Diesel Tractor.

ally collects. It is a compact, quick-dumping unit that operates uphill or down, and will pick up all manner of debris, even brick. It is a 3-wheel unit (illustrated) equipped with a pump-driven spray, bump-proof revolving steel broom that flares out 32 in., and a 3x4-ft. fiber broom that picks up the material and throws it into a 1-yd. trash box. Dumping of the trash box is by hydraulic control.

Byers Machine Co.,
Ravenna, Ohio

A small street sweeper developed by Byers has been named the White Wing (illustrated). It sweeps a little more than a 4-ft. width of streets, next to the curb, by means of a wire gutter-broom throwing the dirt into the path of the main broom, which throws the litter forward directly into a ½-yd. hopper. Brush speeds may be controlled independently of travel speeds and both brushes can be independently raised or lowered. Water spray is fed from a 60-gal. tank. Power is supplied by a 14-hp. gas engine.

Frank G. Hough Co.,
Chicago, Ill.

A special sweeper, designed principally for handling snow, has been announced by Hough. It is a tractor model, made for use with nearly all makes of industrial wheeled tractors (illustrated). It is particularly designed for use in parks, cemeteries, large industrial plants, airports and similar locations.

Material Spreaders

Buckeye Traction Ditcher Co.,
Findlay, Ohio

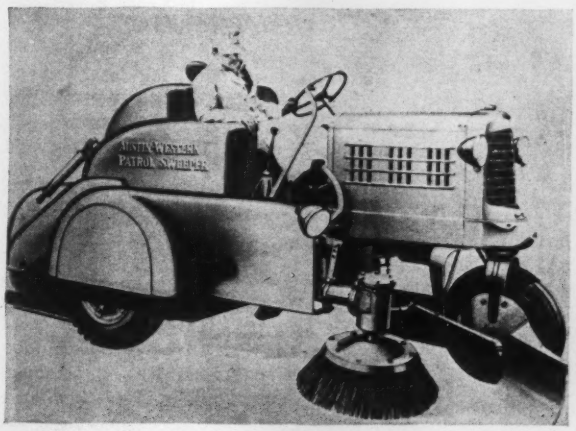
Buckeye has a new material spreader for attaching to trucks (illustrated) that has a transmission drive for forward or reverse operation. This transmission provides for stopping the feed roll instantly, particularly effective for patching jobs. The adjustable hitch permits quick transfer from one truck to another, and is designed to keep the spreader in line with the truck and working in reverse. Accurate control of the material flow is effected through a wedge-shaped gate which slides in over the spirally grooved roll.

Good Roads Mach. Corp.,
Kennett Square, Pa.

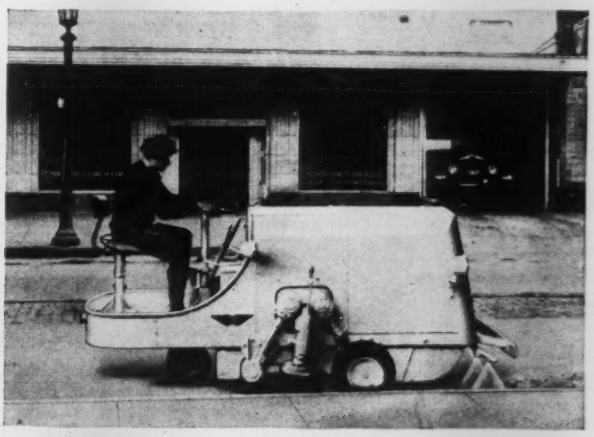
The Good Roads Corp. has developed a new spreader for sand and anti-skid mixture driven by an independent Hercules gas engine. The unit, known as Model Y-186, may be mounted either on a truck chassis or in a truck body; in both cases it is easy in install and remove. The spreader outfit consists of a 6-yd. bin equipped with a large screw conveyor and a spreader of the spinner-disk type that throws the material over a width of 9 to 15 ft. The independent power plant, mounted on the spreader frame, permits control of the spread at any truck speed.

Portable Elevator Mfg. Co.,
Bloomington, Ill.

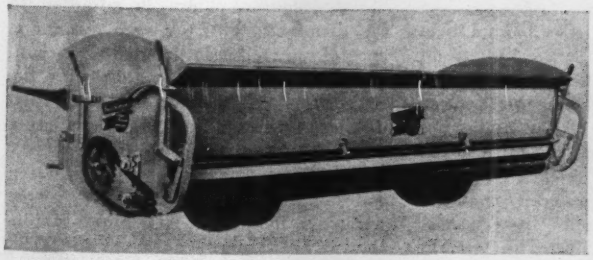
Two new models of the Little Giant sand and cinder spreader have recently been put on the market. These are low-wheel units, available in either single or double spinner styles. Each unit is mounted on two 16-in. ground wheels, which drive the mechanism. Advantages pointed out for the low-wheel mounting are reduction of wind effect on the spreading materials, keeping of the spread below running boards of passing cars, and low center of gravity for prevention of sidesway.



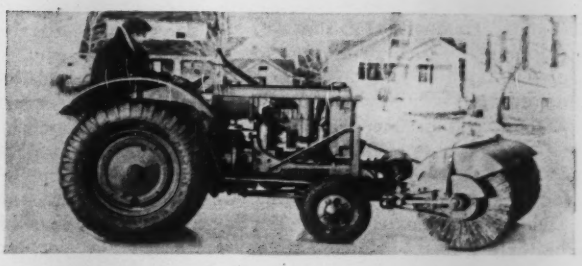
Austin-Western Patrol Sweeper.



Byers White Wing Power Pick-up Sweeper.

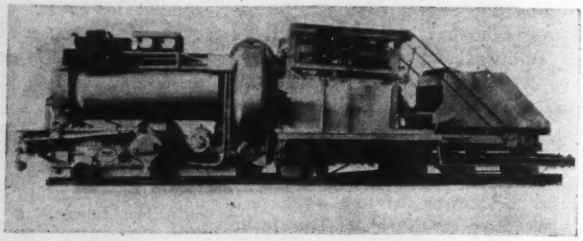


Buckeye Surface Material Spreader Box.

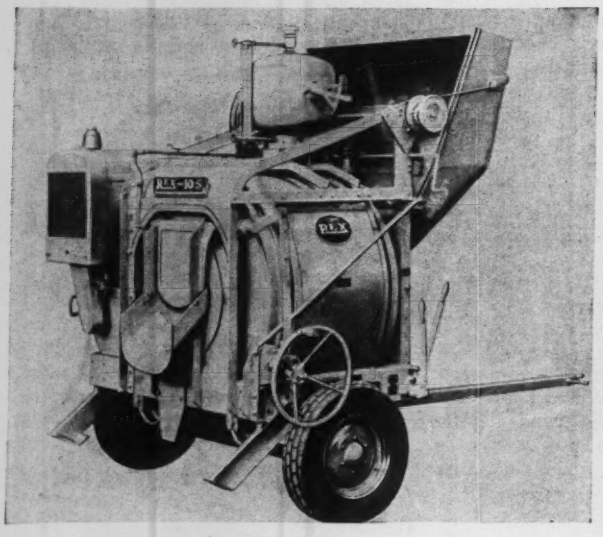


Hough Tractor Snow Sweeper.

Smith-Mobile 1½-yd. Truck Mixer.



Rex Pumpcrete Tunnel Lining Machine.



Rex 10-S Two-Wheel Mixer.

Jaeger 14-S Speedline Mixer.

Concrete Mixers

Chain Belt Co., Milwaukee, Wis.

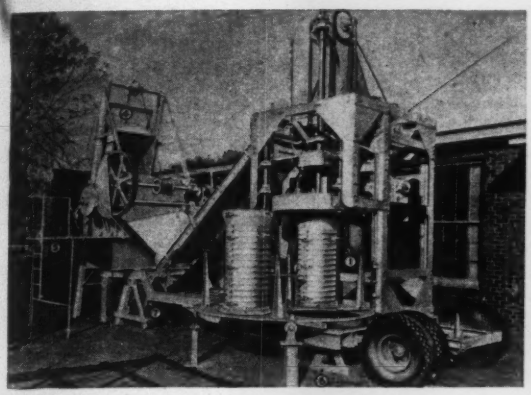
One of the important developments in tunnel concreting equipment is the new Rex tunnel lining machine (illustrated) consisting of a mixer mounted on one car, connected with a Pumpcrete concrete pump mounted on another car. Each car has individual traction drive to operate on 36-in. gage track. Special batch cars charge the mixer in the tunnel, and the mixed batch is discharged directly into the pump hopper. Two of these machines are now in use in the Monticello Water Tunnel in Baltimore. The mixer has a capacity of 1½ cu. yd. Both mixer and pump are powered by individual electric motors. Chain Belt also announces a complete new line of Rex concrete mixers in 3½S, 5S, 7S, and 10S sizes (illustrated). The 5S model is made in two-wheel end-discharge and four-wheel side-discharge style and is powered by a 6 hp. single-cylinder aircooled engine. The 7S is made in similar style with optional power of 1-cylinder aircolled, or 4-cylinder aircooled engine. The 10S mixer is made in two-wheel end-discharge, four-wheel end-discharge and four-wheel side-discharge, powered by a standard or heavy-duty four-cylinder engine. The 5, 7 and 10S mixers use the conventional-type mixing drum; all models have the new Rex water tank equipped with a water measuring control. The 3½S machine is of the tilting type and the front is adjustable to enable the machine to remain in upright position regardless of the unevenness of the ground on which it is working.

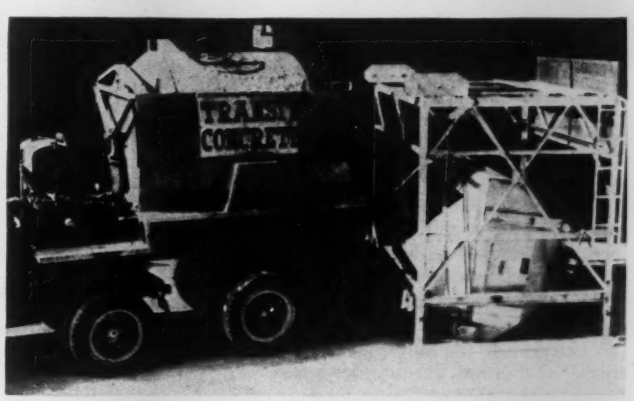
Jaeger Machine Co., Columbus, Ohio

Jaeger has developed a new line of Speedline concrete mixers in 7S, 10S and 14S (illustrated) sizes. The 14S is the newest of the three, mounted on sprink shock absorbers and pneumatic-tired wheels on interchangeable two- or four-wheel mountings for towing behind a truck. On all Speedline mixers the customary large overhead sheave and long lift cables have been replaced with a single skip cable from a low, accessible countershaft. The weight saved by this and other features of design has been put back into the machine in heavier oversize construction in machined drum tracks, engines, clutches, gears, shafts, bearings and other details.

T. L. Smith Co., Milwaukee, Wis.

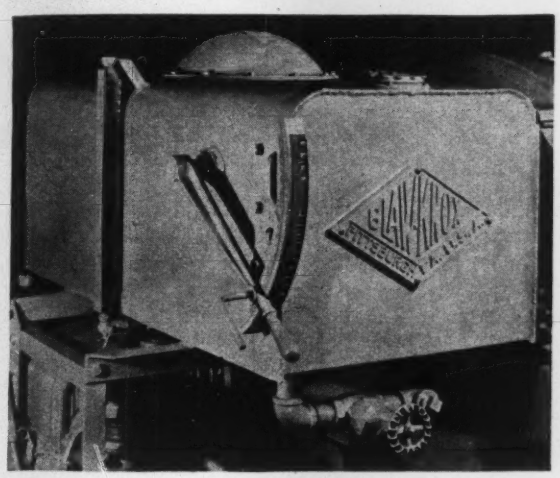
Smith has a new truck mixer, designated as the Smith-Mobile, available in 1½-yd. (illustrated), 2, 3 and 4-yd. sizes. The principal feature of these machines is a new type Duo-Cone mixing drum, equipped with a combination charging chute and sealing door. There is no hatch to open and close. The drum rotates during charging operations, and the batch is dry-mixed by large T-shaped spiral blades designed to give end-to-end movement of the aggregates. Water is admitted to the drum at 50-lb. pressure through a special spray nozzle, located at the top of the drum out of contact with the aggregates. Other features include high discharge without hoist, a distributing spout mounted on a pivoting bracket, and a two-compartment calibrated water tank. A direct-driven rotary pump is included. The Smith-Mobile is also available as agitators in 2-, 3-, 4½- and 6-yd. sizes.

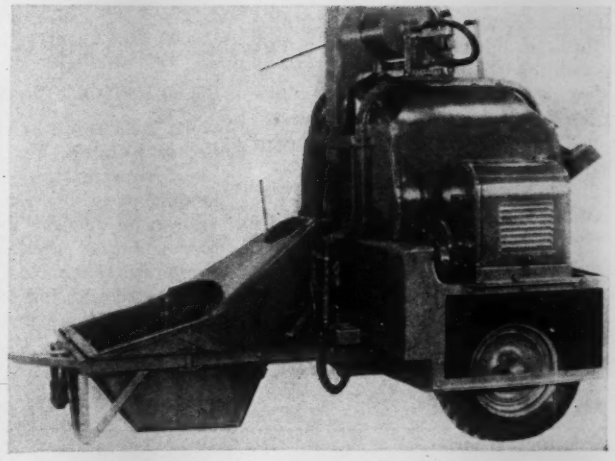




Concrete Pipe Mach. Co. Dual Packer-Head Machine.

Ransome Wet Concrete Storage Bin (upper right).





Gilson Bros. 7S Hydraulic Skip Hoist Mixer.

Blaw-Knox TrukMixer Water Measurer (left).

Gilson Bros. Co., Fredonia, Wis.

A new feature in a line of concrete mixers developed by Gilson is a hydraulic skip hoist, shown in the illustration above on the 7S two-wheel model. Oil is pumped into the hydraulic cylinder, located beneath the drum toward the loading end, at 375-lb. pressure for raising the skip. The hoist is equiped with a positive shaking device which operates by releasing the jack pressure as the skip reaches the top, catching the skip as it faills a few inches, then repeating the cycle. The hydraulic hoist arrangement permits use of a shorter skip than the conventional cable-lift type.

Construction Machinery Co., Waterloo, Iowa

Two new 14S concrete mixers have been brought out by the Construction Machinery Co. to supplement the lighter-weight 14S end-discharge model introduced several years ago. The new machines are a two-wheel end-discharge and a four-wheel side-discharge. They are light-weight construction through full use of manganese steel and other alloys, designed for high production and greater portability.

Ransome Concrete Machinery Co., Dunellen, N. J.

To eliminate delay in unloading truck mixers, Ransome has developed a reservoir storage bin for wet concrete (illustrated). This is a steel hopper that holds a full load of truck-mixed concrete and, equipped with a gate, dispenses the load into wheelbarrows and carts as needed. Reports from the field indicate that the use of the hopper eliminates at least one truck mixer on the average-sized job. In moving from job to job, the hopper is towed behind a truck, riding on a pneumatic-tired trailer. When in use, by means of sheaves and cable, the arriving mixer truck first lowers the hopper body by rotating it inside its frame to receiving position, and after discharging its load the empty truck swings the hopper up to unloading position.

Blaw-Knox Co., Pittsburgh, Pa.

Consistent accuracy and precise measurement of water is claimed for the new Blaw-Knox water-measuring system for truck mixers (illustrated). Operation is automatic, for the operator sets the pointer on the calibrated gage, opens the valve to admit water from the tank into the drum, and after the required amount of water is discharged, the cut-off is automatic. The measuring system is operated through one valve, designed to prevent splashing of water during transit, and operation of the truck over rough ground does not impair its accuracy.

Concrete Pipe Machinery Co., Sioux City, Iowa

A portable concrete pipe manufacturing plant (illustrated) has been developed by the Concrete Pipe Machinery Co. It is powered by a 100-hp. diesel engine, is equipped with a skip loader, and the dual Packer-Head type machine. The batch materials are discharged directly into a mixer, and the mixed material is transported by belt to the pipe caster. Pipe is cast in steel forms, and revolving of a turntable places a new form under the caster and throws the filled form out into the open where it can be removed.

Screeds and Finishers

Adjustable Screed Co., New London, Conn.

Adjustable screed supports, developed to meet problems of screeding and finishing concrete bridge slabs, are now being produced by the Adjustable Screed Co. The supports (illustrated) consist of three parts—a steel bracket, a movable rod, and a steel arm. The bracket acts as a vertical support and is firmly secured to any convenient part of the formwork. A removable rod is mounted on this bracket through a bed, and the upper end of the rod is provided with the nut electrically welded to it. The arm, which is free to revolve on the rod, is confined between this nut and the shoulder, and the arm is further provided with a slot into which a T-bar is placed. The elevation of the T-bar, upon which the screed board rides, is controlled by turning a nut.

Flexible Road Joint Machine Co., Warren, Ohio

Designed to finish concrete with as low a slump as ½ in., the new Flex-Plane gas-electric vibratory finishing machine has been developed by Flexible (illustrated). This machine can also be equipped with a vibrating tube. It is adjustable for full-width construction from 18 to 24 ft., and for half-width construction from 10 to 14 ft. Traction is supplied by an independent motor on each truck. Another new Flexible machine is the brick vibrating machine (illustrated), which vibrates brick in place to produce a monolithic brick pavement job. Another interesting Flex-Plane development is a combination concrete and black-top finishing machine, 52 ft. wide, shipped to Russia a few months ago.

Concrete Buckets

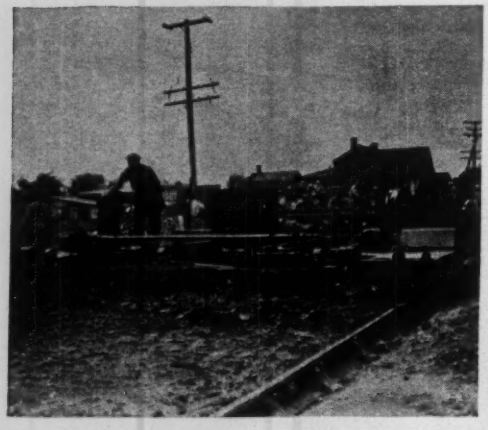
Heltzel Steel Form & Iron Co., Warren, Ohio

A new idea for concrete buckets has been developed by Heltzel, embodying the principle of double-arc clamshell gates on the bottom of the bucket (illustrated). This arrangement provides an automatic controlling feature for pouring narrow forms. The weight of the discharging concrete is concentrated in the center of the bottom of the bucket, which eliminates all tendency for the bucket to jump around.

Cement and Aggregate Handling

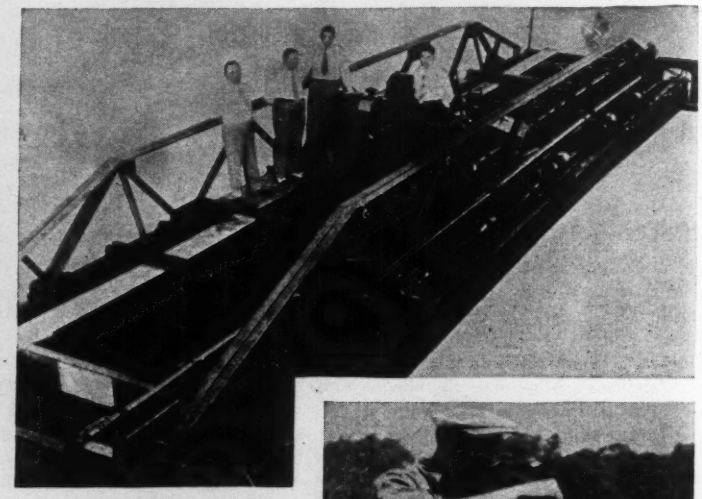
Blaw-Knox Co., Pittsburgh, Pa.

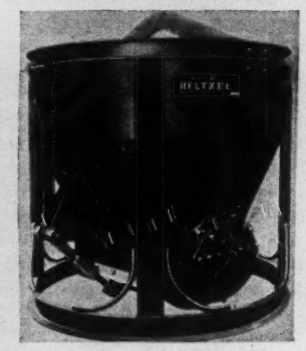
An installation at the W. G. Haden Co. at Houston, Texas, illustrates the latest type of composite truck mixer loading plant developed by Blaw-Knox (shown on opposite page). The design represents a novel combination of equipment to meet local conditions. The circular storage bin is 22 ft. in diameter, and contains seven separate compartments, three for cement, two of which are 125-bbl. capacity, and the third, 250-bbl., and four aggregate compartments holding 56 tons each. Aggregates are loaded by means of crane with clamshell bucket, and bulk cement is received in box cars unloaded by screw feed to a vertical bucket elevator, and distributed to the three compartments by a slot gate and chute. The



Flex-Plane Gas-Electric Highway Finisher

Flex-Plane Paving Brick Vibrator (below).





Heltzel Concrete Bucket (center). Flex-Plane 52-ft. Screed (top right). Adjustable Screed Co. Bridge Floor Screed (right).

driveway for truck mixers and batch trucks is depressed into a tunnel beneath the plant. The aggregate weighing batcher is of 2-yd. size equipped with a springless dial scale, and the cement-weighing batcher is of similar size equipped with a beam scale. Both batchers are manually operated. Another new Blaw-Knox installation is a composite weighing batcher (illustrated) designed for Penker Construction Co. on the Pennsylvania Ave. Bridge in Washington. It is a 2-yd. batcher for cement and three classes of aggregates. The aggregate bin is a 3-compartment unit of 120 tons capacity supplemented by an auxiliary cement pocket of 15-bbl. capacity. The main feature of this proportioning unit is that all filling gates and the discharge are mechanically interlocked. A new means of batch hauling and dumping bulk cement for construction work is provided by a cement bag designed by Blaw-Knox. This bulk cement container (illustrated) has a capacity of eight standard batches, and is made of heavy rubberized canvas. The closed end is bolted to the partition board of the hauling truck; the other end is open and fitted with flap covers. After loading, the end flaps are folded and the weight of the cement pressing against the aggregate seals the bag. When dumping the batches, the flow of the aggregates releases the pressure on the folded flaps and the bag opens automatically.

Goodyear Tire & Rubber Co., Akron, Ohio

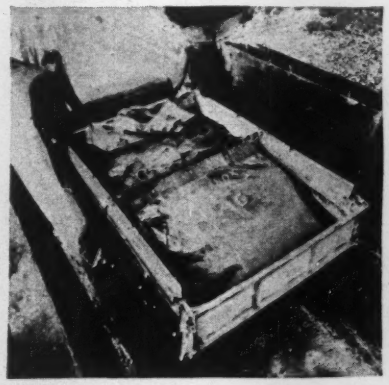
Transportation of aggregate by belt conveyor reached new proportions at Grand Coulee where a 48-in. belt, 9,700 ft. long, has been built into a conveyor 4,850 ft. long (illustrated). Goodyear designed, built and installed the belt. It was shipped in eight separate pieces weighing 10 tons each, consisting of rolls 10 ft. in diameter. During installation the sections were vulcanized into one continuous endless belt weighing 80 tons.

Link-Belt Co., Chicago, Ill.

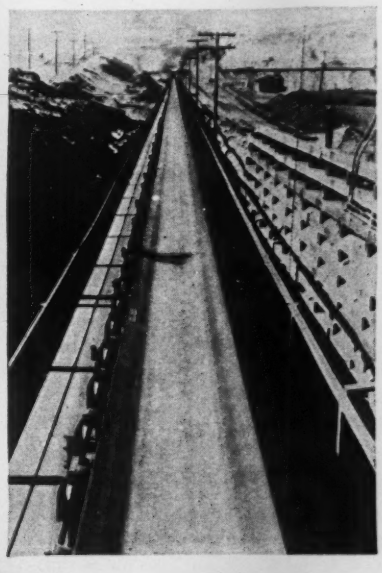
Link-Belt's contribution to aggregate handling is a new low-priced troughed anti-friction idler for belt conveyors (illustrated) for handling materials of medium weight. It is known as the Type 90, designed for conveyor widths of 14 to 24 in. and the 4-in. idler rolls are carried on ball bearings.

Butler Bin Co., Waukesha, Wis.

Butler has a new type of boxcar portable bulk cement handling plant, which takes cement direct from car through a weighing batcher into trucks or other vehicles without the use of overhead reserve storage. The plant consists of a steel framework for supporting the cement weighing batcher, which is inclosed in a rain-proof steel housing, and an inclined screw conveyor with a car door hopper mounted at the base to receive cement from the car, operated by a gasoline engine. A clutch lever from the engine extends over to the operator's position, and by throwing in the clutch, the screw conveyor is put into operation, delivering cement into the batcher. Laborers inside the car keep the car door hopper full by use of two-wheeled scoops when the cement connot be shoveled directly into the hopper. The plant is capable of delivering 60 to 70 batches per hour, and is portable.

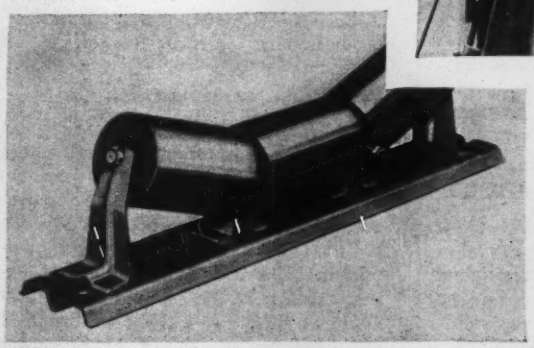


Blaw-Knox Batch Cement Bag.

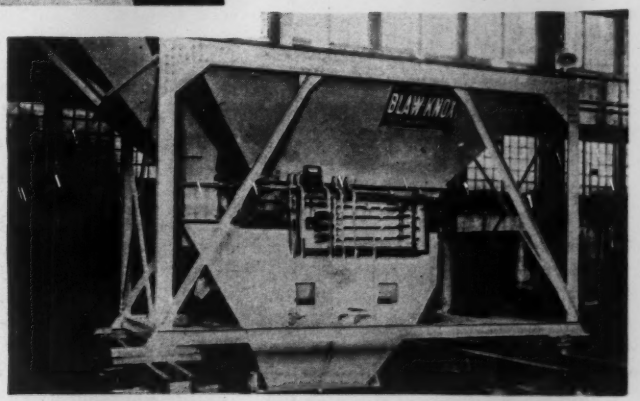


Goodyear Conveyor Belt (left).

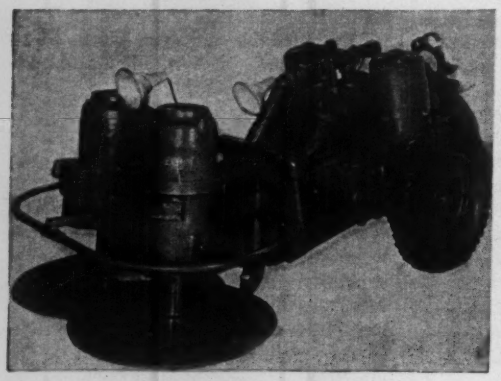
Blaw-Knox Truck Mixer Loading Plant.



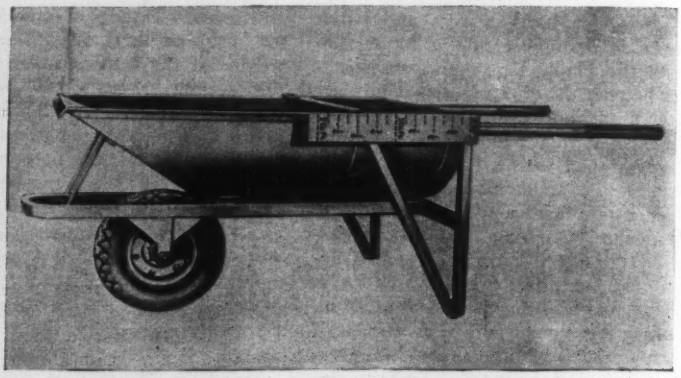
Link-Belt Conveyor Idler.



Blaw-Knox Composite Weighing Batcher (right).

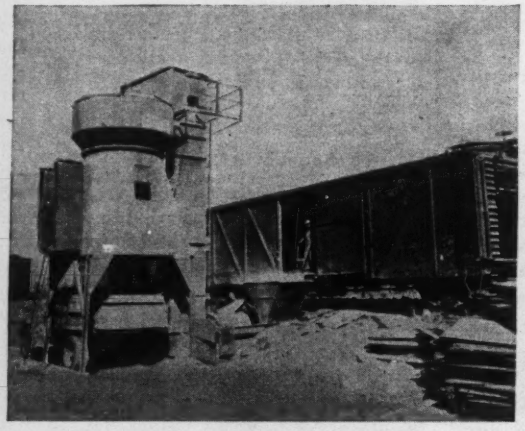


Fuller Remote-Control Cement Unloader.

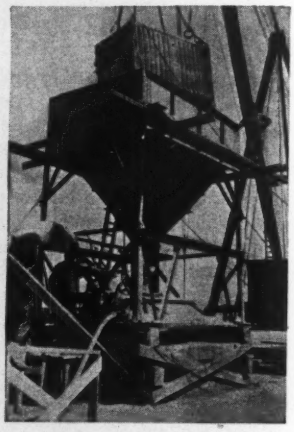


Concrete Pipe Machinery Co. Volumetric Batch Wheelbarrow.

Heltzel Bulk Cement Plant.



Johnson Bulk Cement Plant.



Robinson Cement Conveyor.

Heltzel Steel Form & Iron Co., Warren, Ohio

Heltzel's most outstanding development of the year was the new portable bulk cement plant, Model E1 (illustrated). This unit is designed for handling bulk cement from car to batcher or mixer truck. It consists of a horizontal screw conveyor, a bucket elevator, built into the plant, charging an overhead storage bin, and a weighing batcher of 16-cu.ft. capacity. Features of the new plant are absolute dustless batching of cement (because of a relief pipe from the batcher housing to the top of the bin which automatically takes all dust from the batcher and returns to the bin) and the ease in moving completely assembled. As the elevator is built into the structure, it is necessary only to remove the horizontal screw conveyor and the 10-hp. gas engine before moving.

Gwynn Robinson, New York City

Robinson has developed a new type of cement unloading and conveying system (illustrated) in which compressed air is used first to aerate cement in the tank and then to transport the aerated material through pipes to a bin at the top of the mixing plant. The illustration shows the conveying system being charged by an LCL container, but it works equally well when placed under the track for operation with bottom dump cars. In brief, operation of the system consists in dropping cement into the tank, opening the air inlet to build up the pressure in the tank to 60 lb., while the discharger valve remains closed, and finally opening the discharge valve to transport the aerated cement to the bin. Compressed air is allowed to flow into the tank during the transporting operation until the pressure drops to 20 lb. The air supply is then shut off and the 20-lb. pressure remaining in the tank is utilized to clean out the main conveyor line.

C. S. Johnson Co., Champaign, Ill.

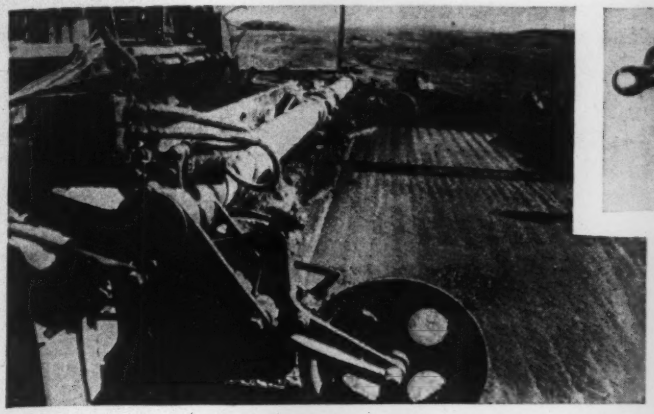
The Johnson "Dutch Mill Cement Plant" (illustrated) has been developed for modern paving jobs requiring a portable plant. The bin structure is of welded metal construction designed so the supporting legs may be folded up, the elevator disconnected and the plant transported as one unit. All controls are located in the operator's compartment, making the plant a one-man affair. The bucket elevator is equipped to take cement from the hopper-bottom cars or from box cars, and is driven with either electric motor or gasoline engine.

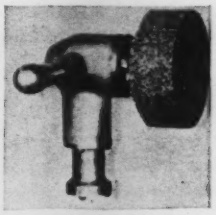
Concrete Pipe Machinery Co., Sioux City, Iowa

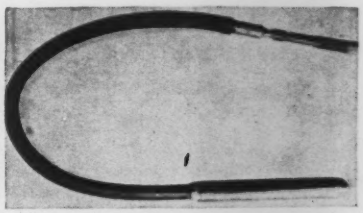
A volumetric batcher wheelbarrow for charging concrete mixers with aggregates from ground storage has been put on the market by the Concrete Pipe Machinery Co. Adjustable to seventeen different widths (illustrated) it can be set for any content from 2 to 4 cu.ft. by ⅛-cu.ft. stages.

Fuller Co., Catasauqua, Pa.

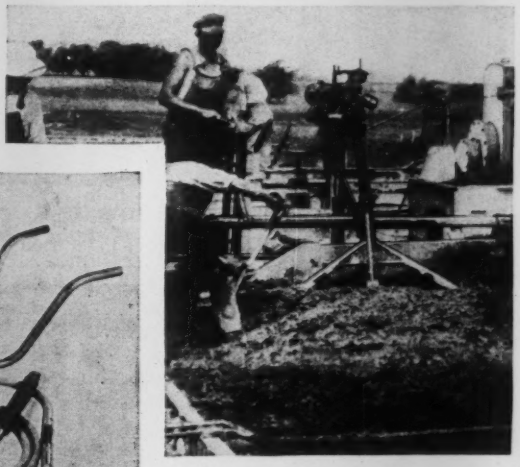
The latest type Fuller-Kinyon cement unloader is the remote control model (illustrated), a heavy-duty large-capacity machine. The remote control feature permits the operator to advance the unloader into the cement and maintain it under full load, stopping, starting, turning and maneuvering the machine at will. Thus, the operator need not enter the warehouse, barge or car to control movement of the machine. The loader is automatic feeding, with automatic start and stop control in accordance with load.





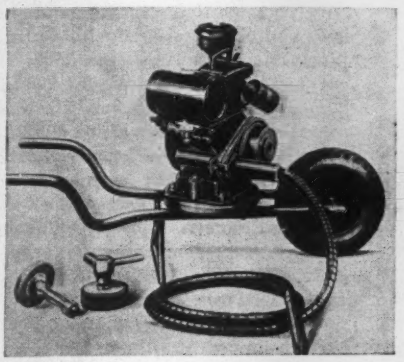


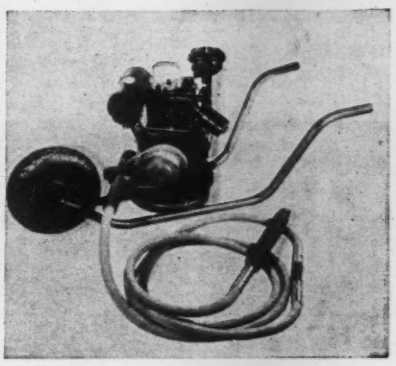
Berg Angle Head Concrete Grinder (above center).
Chicago-Pneumatic Shimmy Spade (above right).
Jackson Vibratory Paving Tube (left).



Mall Double Highway Vibrator.

Syntron Engine-Drive Vibrator (below left).
Master Engine-Drive Vibrator (below right).





Concrete Vibrators

Mall Tool Co., Chicago, Ill.

Mall has developed a new highway concrete vibrator which can be attached to any make of pavement finishing machine (illustrated). Single units handle pavements up to 12 ft. wide, and double units up to 20 ft. wide. The unit is adjustable for vibrating crowned or flat pavement. Power is supplied by 3-hp. gas engines, transmitted to the vibrator tool by flexible shafting. The units are so designed that they can be lifted vertically out of the concrete permitting vibration near the expansion joint.

Electric Tamper & Equipment Co., Ludington, Mich.

Outstanding in the line of Jackson concrete vibrators is the new heavy-duty Vibratory Paving Tube (illustrated) designed for concrete paving work. The complete paving tube assembly is carried independently of the finisher and may be used with any type or make of finisher by attaching two push-rod brackets. No permanent attachment to the finishing machine is necessary, except for a base for the electrical power unit and a small hydraulic pump lever used in raising and lowering the tube. Automatic controls are such that the operator pays attention only to the hydraulic pump lever, and the vibratory motors are automatically stopped and started as the tube is raised and lowered into the concrete. For 18- or 20-ft. slabs where the mix has a slump ranging from 1 to 2½ in., the single tube is generally satisfactory, but on large jobs the Super Twin-Tube model is recommended. Power for operating the tube is supplied by a gas engine-driven generator, which also has reserve power for operating floodlights and small portable electric tools.

Syntron Co., Homer City, Pa.

A line of gas engine driven internal concrete vibrators has been brought out by Syntron, powered by 3-hp. air-cooled gas engines. The units are mounted either on a pneumatic-tired wheelbarrow chassis or on a swivel pedestal base. Vibrating tools are either 1⅝x18 or 2⅝x18 in., consisting of sealed steel cylinders with an unbalanced shaft inside mounted in ball bearings.

Master Vibrator Co., Dayton, Ohio

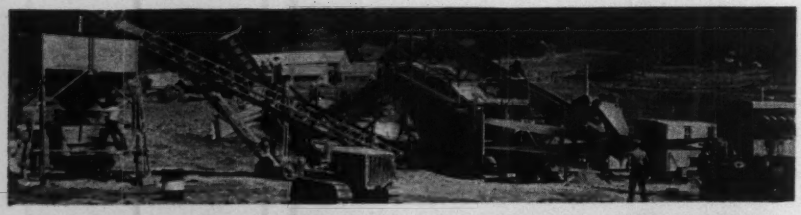
Master has a new line of high-frequency constant-amplitude vibrators, operating at constant speeds, both in electric and gas-engine drives. The latest development is a gas-engine type mounted on wheelbarrow trucks (illustrated). The vibrating ends are available in a wide range of sizes from 1⅝ in. up to 3⅜ in. in diameter.

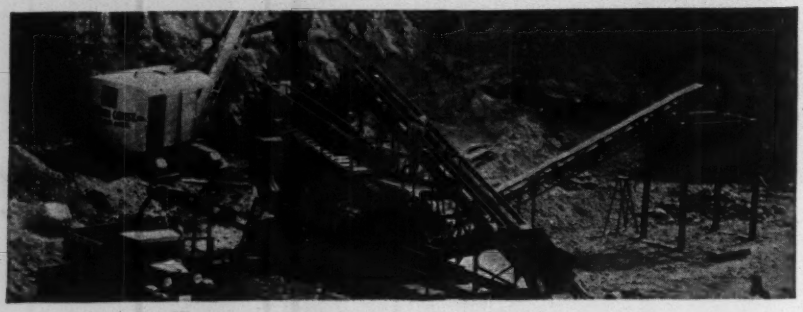
Concrete Surfacing Mach. Co., Cincinnati, Ohio

Additions and improvements in the Berg line of concrete grinding equipment include three Berg right-angle heads and three Berg right-angle and cylinder heads, either type available in three operating speeds. The right-angle heads (illustrated) are arranged for grinding with a cup-shaped wheel. The right-angle and cylinder heads are combination heads, designed for handling a cylindrical wheel or roller. By removing several parts, the latter head can be inserted into the former type. A cutter plate can also be used with the higher gear ratios. Complete motor units with shaft and casing are available.

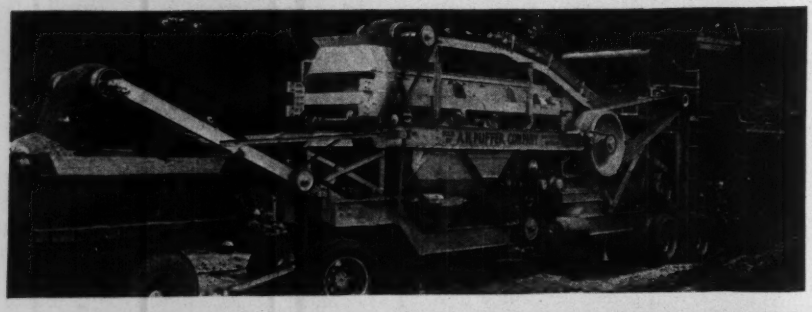
Chicago Pneumatic Tool Co., New York City

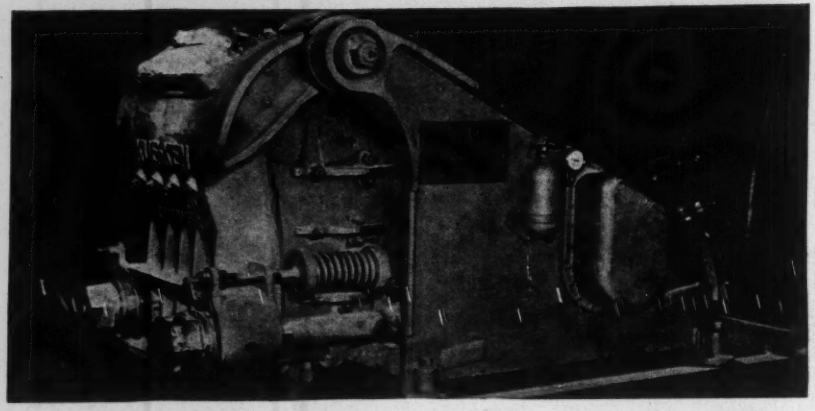
The latest in the Chicago Pneumatic line of pneumatic concrete vibrators is the Model 219 Shimmy Spade (illustrated). This is a 2½-in. diameter, light-weight vibrator for fast use in thin walls, floor and roof slabs where the concrete is not under 3-in. slump.





Pioneer Rock Chip Producer on Portable Screening Plant.
Pioneer 48-V Duplex Portable Screening Plant (top).





Straub Kue-Ken Balanced Crusher.
Iowa Junior Tandem Straightline Screening Plant (center).
Iowa Senior Stabilizing Plant (top).

Screens and Crushers

Iowa Mfg. Co., Cedar Rapids, Iowa

To meet the need for a plant to produce stabilized road materials, Iowa Mfg. Co. has produced the Senior stabilizer (illustrated). This unit includes a 17-ft. single shaft pugmill, a 16x16-in. disintegrator roll crusher, calcium chloride feeder, twin-screw clay feeder, apron-type gravel batcher, 18-in. clay conveyor, and a 24-in. delivery conveyor, all mounted on one chassis. The unit is powered by a 100-hp. Waukesha gas engine and is charged by a dragline or crane. A 10-ton special bin, fed by a belt conveyor from the plant, loads the stabilized material into trucks. Another new development by the company is its Super Straightline screening and crushing plant. It is equipped with a primary jaw crusher and a secondary roll crusher, both on frictionless bearings, a Symons double-deck vibrating screen, a swivel feed conveyor, a channel frame delivery conveyor and two return conveyors. Except for the feed conveyor, the entire plant is mounted on a six-wheel chassis. Power is supplied by an independent tractor or other power plant. This plant has a screen area of 98 sq.ft. and the screen can be changed by removing a few bolts. The Junior Tandem Straightline plant (illustrated) includes most of the features found on the Super plant, and has a primary jaw crusher, secondary roll crusher, Symons screen, feed conveyor, truck-loading delivery conveyor, rejection conveyor, track, feeder, and sand eliminator, all on one truck with solid rubber tires.

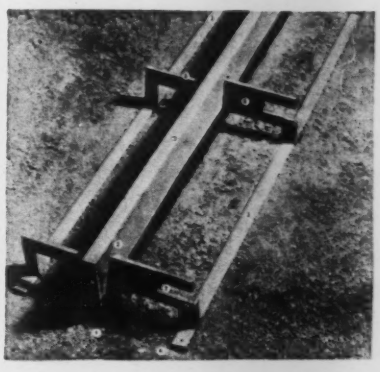
Straub Mfg. Co., Oakland, Cal.

A new principle of crushing has been incorporated into the Kue-Ken balanced rock crusher (illustrated). These units are available in a full range of sizes from the No. 10 machine, receiving rock 5x10 in., to the No. 150 machine, receiving rock 16x48 in. The Kue-Ken crushing principle employs two long, balanced pendulum jaws, each traveling a short distance and swinging toward each other in harmony. Thus, the rocks are instantly gripped and pressed down without abrasion, crushed and released. The upper ends of the jaws travel through a shorter distance than the lower ends, which means maximum leverage on the larger rock and longest jaw travel on the large volume of smaller material at the lower end. The operating mechanism is in a sealed dustproof housing protected by special rubber seals. The lower part of the housing serves as an oil reservoir and a positive pump on the outside of the housing forces the oil to all moving parts. The crusher reduces rock to as fine a size as

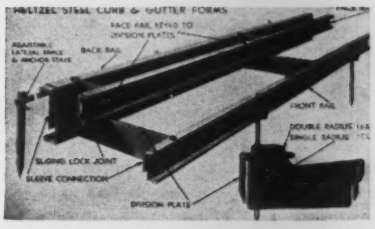
desired in one operation. Size adjustment is simple and positive.

Pioneer Engineering Works, Minneapolis, Minn.

Blacktop road construction usually requires rock chips for the seal coat, and to meet the demand for large quantities of rock chips, Pioneer has designed a screening arrangement for its Vibrator Duplex portable crushing plant that will produce rock chips as a byproduct simultaneously with making road gravel. There is no waste material, for the crusher dust is screened out of the chips and mixed with the road gravel. Also, there is no additional expense as no extra screens or equipment are required. As the crusher jaw clearance is not reduced, the total production is not curtailed. In Pioneer plants the bottom deck screens the pit run material only, and the top deck screens the crushed material only. In this screening arrangement, the pit material and the crushed material are not mixed together, therefore it is possible to screen out the crusher chips on the top deck. Chip spouts are provided to deliver chips onto a belt conveyor. Pioneer has also produced a new 48-V Duplex crushing, screening and loading plant (illustrated) with a 10x36-in. primary jaw crusher and the Super-40 secondary roll crusher. The machine is rated at 200 to 400 tons per hour. It has a bottom deck feed which doubles the specification screen area. It is mounted on pneumatic tires with vacuum brakes, and the conveyors are equipped with low-mast trucks with pneumatic tires.



Godwin Expansion Joint Assembly



Heltzel Curb and Gutter Form.

Forms and Joints

Heltzel Steel Form & Iron Co., Warren, Ohio

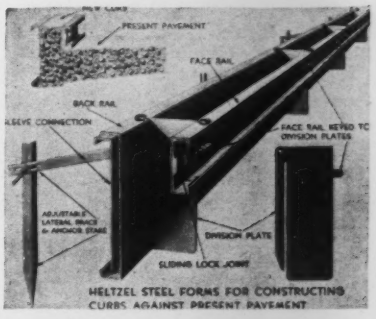
Heltzel has made several major improvements in highway and curb form equipment, particularly in finished curb and gutter forms and forms for curbs against present pavement. The latter two are illustrated on this page and the salient features are self-explanatory.

Blaw-Knox Co., Pittsburgh, Pa.

Two new steel forms for highway and street work have been put out by Blaw-Knox. One of these is the self-aligning road form (illustrated) of heavy construction with rigid bracing connecting the head of the form with its base. There is also an adjustable wedging feature for the stake which prevents strain on the form due to stakes going out of plumb or being bent during driving. An unusual design of steel curb form (illustrated) is now made by Blaw-Knox, in which none of the connecting or bracing devices that hold the base form in place projects above the top of the form. The elimination of ties or spacers above the top of the form is particularly desirable when pouring the curb with truck-mixer chutes.

W. S. Godwin Co., Inc., Baltimore, Md.

Godwin has just developed a new type of self-aligning dowel-joint assembly for concrete paving (illustrated). It consists of a truss that supports any size or kind of joint filler in rigid, vertical position, a removable filler shield held to line and grade by the trusses, and two flat continuous parallel supports equalizing the subgrade contour and preventing settlement. The assemblies are not easily displaced during placing and working of the concrete. They are rigidly welded to insure the necessary alignment and level of all trusses and fillers, and the trusses have been tested to transmit 12,000 lb. wheel loads in either direction. An 11-ft. assembly can be installed in less than two minutes by one man.



Heltzel Curb Form.

Bituminous Equipment

Jaeger Machine Co., Columbus, O.

The Mixed-in-Place Road Builder, recently developed by Jaeger, has been found to be particularly adaptable to base stabilization work as well as for mixing and placing of the bituminous top course (illustrated next page). In operation the road builder picks up the material from windrows or gathers it direct from a scarified rough grade, which it cuts to the grade line, then passes the material through twin pugmills as the machine advances, and either spreads or windrows to the rear. Helical gathering screws leading to the pugmill provide a uniform flow of material, and permit rapid forward travel without clogging. The machine is equipped to measure and apply binder or water while mixing. Where aeration of the mixed material is not required, the Road Builder can be equipped with adjustable strike-off screed, mounted on floating 21-ft. straightedge levelers which equalize the rough subgrades and, in combination with a two-way remixer and spreader screw at the rear, lay out a smooth surface ready for final rolling. Lanes up to 12 ft. wide and as deep as 9 in. uncompacted may be so

Blaw-Knox Road Form.

Blaw-Knox Curb Form.

laid. The machine is mounted on full crawlers, heavy-duty type, and is powered by a 150-hp. gas or diesel engine. Four travel speeds vary from 50 to 150 ft. per minute.

Iowa Mfg. Co., Cedar Rapids, Iowa

One of the latest models of asphalt plants built by the Iowa Mfg. Co. is the 2,000-lb. portable hot asphalt plant, tower type (illustrated). This unit includes a 5x24-ft. dryer complete with 16-ft. cold elevator and burners, oil burner pump and heater set, 3x10-ft. double-deck Symons screen, 2,000 lb. steam-jacketed pugmill on self-aligning bearings, 2,000-lb. aggregate batcher and a 33-ft. hot elevator. It is powered by two 60-hp. gas engines and produces from 25 to 28 tons of material per hour. This company also produces the improved Cedar Rapids Road Mix plant, a traveling pick-up type machine. The batching and mixing arrangement are the same for both types of plant. A feature of the mixing arrangement is that all paddles on the pugmill shaft are interlocking, thereby transmitting the torque to the driving head at the intake end of the pugmill, eliminating torque from the shaft itself. The rig may be mounted on solid rubber tires, pneumatic tires or crawler tracks.

Barber-Greene Co., Aurora, Ill.

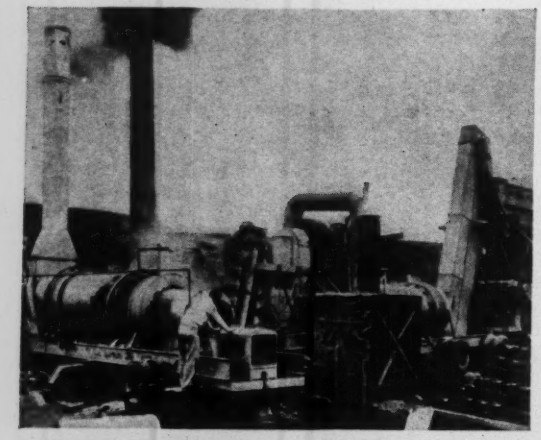
Barber-Greene offers the tamping-leveling bituminous finisher (illustrated) as a machine that lays, tamps and finishes all types of mixed bituminous materials, including hot sheet asphalt. This machine normally lays a path 10 ft. wide, but can be altered to any width between 8 and 12 ft. It is self-propelled, mounted on full crawlers and is charged by trucks backing up against two rollers. The machine, through these rollers, pushes the truck ahead as it is being unloaded, without interrupting the paving operations. From the large receiving hopper, independently-operated light conveyors discharge the material into a spreading chamber, where two independent screw conveyors spread the material across the road. A tamper, operating at 1,200 strokes per minute, strikes off and tamps the material. Immediately behind the tamper is a screed, which can be heated or not as desired. The tamping, combined with the automatic leveling of the machine, produces a level surface over an irregular subgrade. The thickness of the finished mat can be adjusted as desired, but any change in thickness while operating is done slowly to prevent abrupt changes.

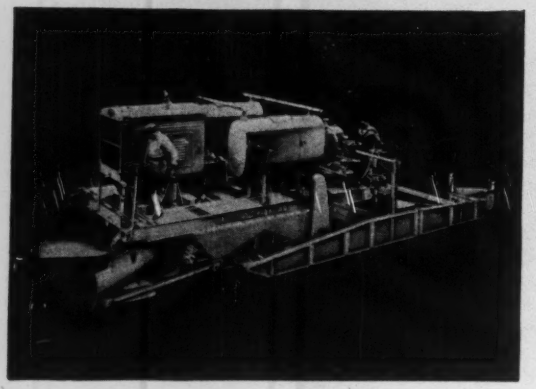
Blaw-Knox Co., Pittsburgh, Pa.

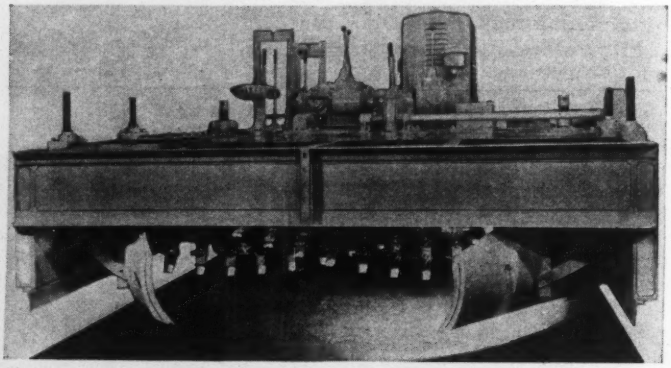
Blaw-Knox is now building a new Roadbuilder (illustrated) that is adaptable to sub-grading for pavement, for widening work, for building shoulders along existing highways and for stabilizing secondary highways. In addition, it pulverizes and mixes material for granular stabilization and the lighter types of oil mix work. The machine travels on the subgrade without the use of forms, and conveyors dispose of the excavated material outside the subgrade area. It travels on crawler-type tracks, is self-propelled, and its digging and pulverizing teeth are adjustable for crown and cut to a maximum depth of 10 in. Only a final blading and rolling are required after passage of the roadbuilder.

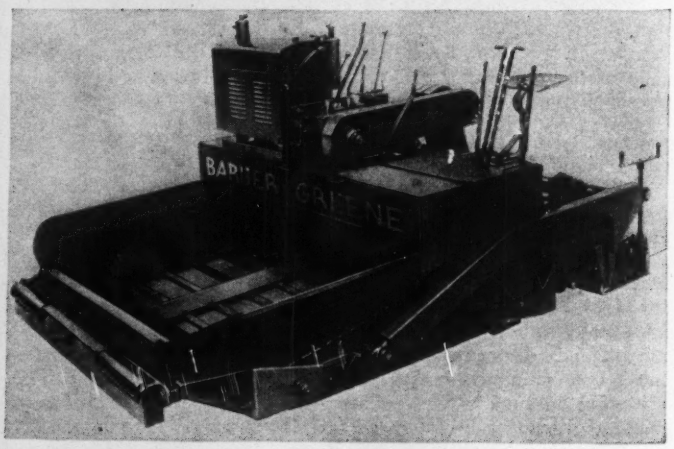
Blaw-Knox Roadbuilder (right).

Iowa Portable Asphalt Plant (below).









Barber-Greene Bituminous Finisher.

Jaeger Road Builder (left).

Air Compressors

Schramm, Inc., West Chester, Pa.

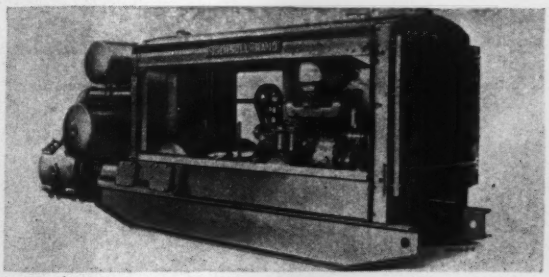
Schramm has a new line of lightweight streamlined Utility compressors, available in portable and stationary mountings, gasoline or diesel engine drives, standard and de luxe models from 85 to 420-ft. capacity. The 105-ft. two-wheel mounted and the 210-ft. four-wheel gas engine driven models are illustrated below. Lighter weight construction of these compressors is obtained by using smaller, lighter reciprocating parts and by operating the parts at a speed of modern engine efficiency. Schramm believes in using more lightweight smaller pistons instead of fewer heavier and larger pistons. A feature of all of Schramm's compressors is the mechanical intake valve, built into the compressor block. Also, because the intake valve is built into the block, it is possible to devote the entire area of the cylinder head to one big discharge valve. The compressor and engine are assembled with built-in couplings, mounted in the frame as a solid unit. Both engine and compressor are water-cooled. Compressor bearings are lubricated by force-feed and there is a main bearing between every cylinder. Buda gas or diesel drive is optional on all models.

Ingersoll-Rand Co., New York City.

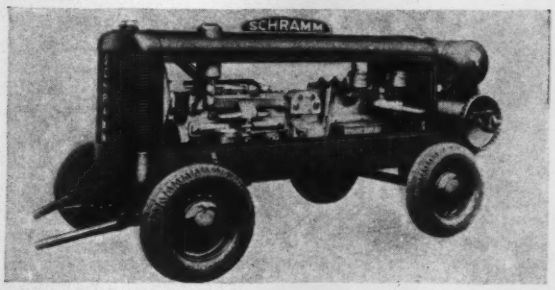
Ingersoll-Rand has just announced a new heavy-duty diesel engine driven compressor, Type XVO (illustrated). This compressor is entirely new in design, and combines a horizontal heavy-duty double-acting compressor with a heavy duty V-type four-cycle diesel engine in a single, compact and comparatively light weight unit operating at a moderate speed. The XVO is available in three sizes, 625-, 935- and 1,250-cu.ft. Another new heavy-duty large-capacity semi-portable compressor, the Model 425 (illustrated), was put on the market by Ingersoll-Rand last July. It is a self-contained compressor plant available in portable or semi-portable mountings, and employs the same slow-speed, heavy-duty stationary-type compressor usually purchased for a permanent installation. The four-cylinder heavy-duty tractor-type engine drives the compressor through simple reduction gears, and either gasoline or oil engines can be furnished.

Gardner-Denver Co., Quincy, Ill.

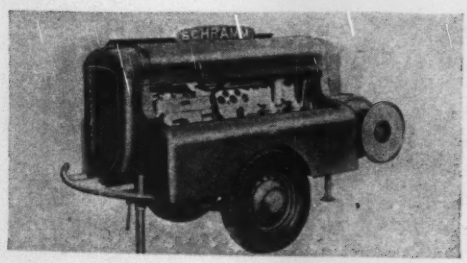
The Gardner-Denver improved line of WB vertical water-cooled air compressors is being used extensively on construction work. These are stationary plants, driven by separate gas or diesel engines or built-in motors (illustrated). The compressors are of the two-stage water-cooled type; the three-cylinder models have two low and one high-pressure cylinder; the six-cylinder models have four low and two high-pressure cylinders. Where running water is not available, a combination radiator-intercooler may be furnished; the intercooler is air-cooled. In this style the compressor cylinders and heads are water-cooled and a small amount of water is required for the radiator. These models are available in capacities from 150 ft. to 36-ft. Gardner-Denver also has a full line of improved two-stage portable air compressors in gas engine drives from 105 to 315-ft. capacity and diesel engine drives from 160 to 420-ft. capacity.

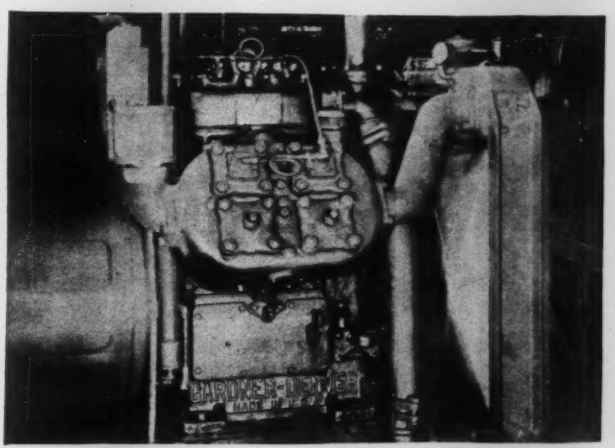


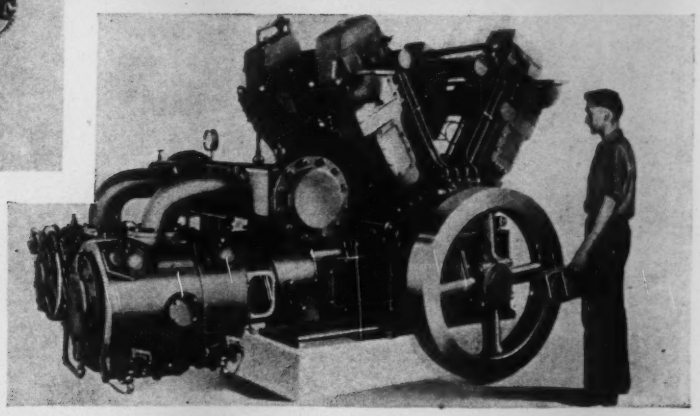
Ingersoll-Rand 425 Diesel Compressor.



Schramm 210 Utility Compressor.



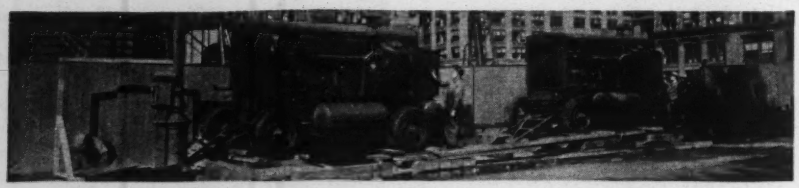




Ingersoll-Rand Heavy-Duty XVO Diesel Compressor. Gardner-Denver WBQ Compressor (top). Schramm 105 Utility Gas Compressor (left).

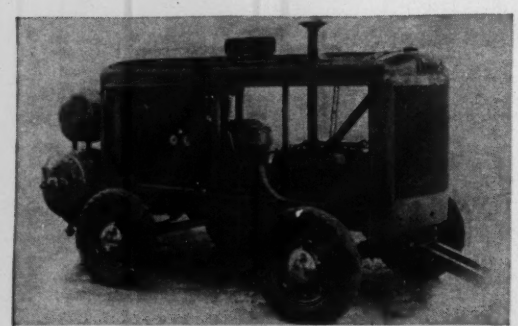
Chicago Pneumatic Tool Co., New York City

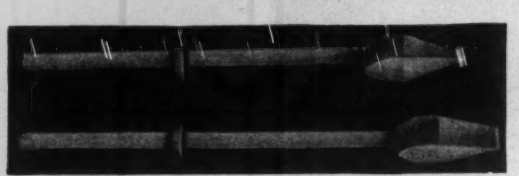
The latest development in the Chicago Pneumatic line of compressors is the Class WO2 portable (illustrated). This is a heavy-duty diesel-driven compressor with a capacity of 700 cu.ft. per minute. It consists of a Type 48 vertical four-cylinder, four-cycle medium-speed diesel engine on a common crankcase and crankshaft with a V-type two-stage double-acting water-cooled compressor, with suitable cooling systems and air receiver, all on a structural steel deck arranged for mounting on skids or on wheels, forming a complete self-contained portable unit. Air regulation is by the three-stop method in conjunction with a pneumatic throttle. At a fixed discharge pressure, the inlet valves in one end of each cylinder are held open, reducing the capacity one-half, and the engine speed is also reduced approximately one-half. With a further increase in discharge pressure, the compressor is completely unloaded. The diesel engine is started by a small four-cylinder gas engine.



Chicago-Pneumatic WO-2 Portable Compressors.

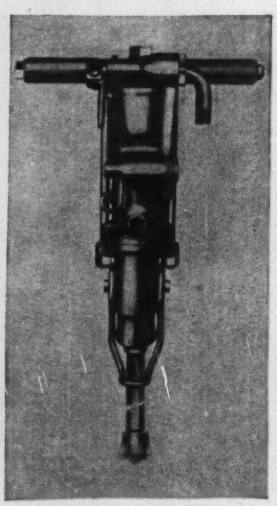
Davey 315 Side-by-Side Two-Stage Compressor.





Sullivan Arropoint Concrete Breaking Steel.

Davey 105 Two-Stage Compressor (top).



Ingersoll-Rand Lightweight JA-35 Jackhamer.

Davey Compressor Co., Kent, O.

Recent improvements in the Davey line of air-cooled air compressors include streamlining of all models and a reduction in weight and overall dimensions to conform with present-day trend of equipment design. A popular new model is the 105-ft. two-stage unit (illustrated) spring-mounted on four pneumatic tires. This compressor is highly portable and can be towed behind a truck at speeds up to 50 m.p.h. It is 116 in. long, 66 in. wide and 72 in. high, and weighs only 3,300 lb. Another new portable unit is the Model 315 side-by-side machine (illustrated). In this unit the engine and compressor are mounted side by side, thus giving a short compact machine only 130 in. long, 92 in. wide and 72 in. high. It is equipped with automotive type steering, can be turned in shorter space and towed faster and by lighter trucks than previous models. Davey has just announced a full line of 210-ft. truck-mounted compressors. The line of tractor-mounted compressors is now available in a wide range of models from 85 to 420-ft. capacity.

Air Tools

Ingersoll-Rand Co., New York City.

A new lightweight Jackhamer, the JA-35 (illustrated) was announced last summer by Ingersoll-Rand. It is a lightweight, yet powerful drill, styled after the older and heavier JA-45 and JA-55. It weighs less than 35 lb., but it is an easy-handling fast drilling machine.

Gardner-Denver Co., Quincy, Ill.

The latest development in the Gardner-Denver line of drifter drills is the automatic-feed motor-drive series. Power from an air-driven piston is transmitted to the feed-screw nuts of the drill, and the feed screw is held stationary. This power is adjustable for different formations and the machine has an equally strong advance and return action. The automatic-feed drifters come in three sizes—the AF-79, weighing 159 lb.; the AF-89, (illustrated), 185 lb.; and the AF-99, 235 lb. All three models are fitted for 24-in. change of drill steel. They are 3-in., 3½-in. and 4-in. bore, respectively.

Cleveland Rock Drill Co., Cleveland, Ohio.

Last year the Cleveland Rock Drill Co. introduced the new Model H-10 (illustrated) 45 lb. hand rock drill, designed along the same lines as the heavier H-11, a 56-lb. drill. The H-10 is designed principally for soft and medium rock, but has proven satisfactory in hard rock as well. It is available in

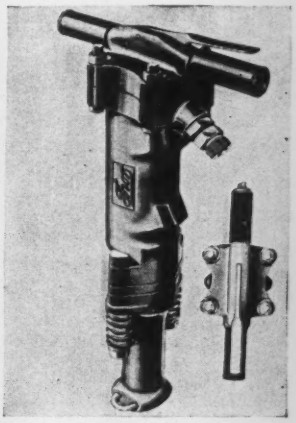
two types of handles, as shown. It can be had in either dry, constant-blowing, or in the wet type. A mounting is also available for the H-10, similar to that of the H-11, by which the drill can be quickly converted to a light drifter type. These drills are equipped with the automatic valve, a combination of spool and disk type, designed in such a way that the wear of long service does not increase air consumption. Cleveland has improved the Model DR-8 drill rig (illustrated), by adding to it the new Recoil Device. This is a simple and durable ratchet-and-pawl mechanism mounted on the front sprocket axle, designed to hold the machine consistently to its work without any cramping or crowding. It conserves the piston blows that might be wasted if struck while the drilling machine is on the rebound, and increases cutting speed by 10 to 25 per cent over former performance of this rig. The Recoil Device can be put on any DR-6 wagon drill now operating in the field.

Sullivan Machinery Co., Michigan City, Ind.

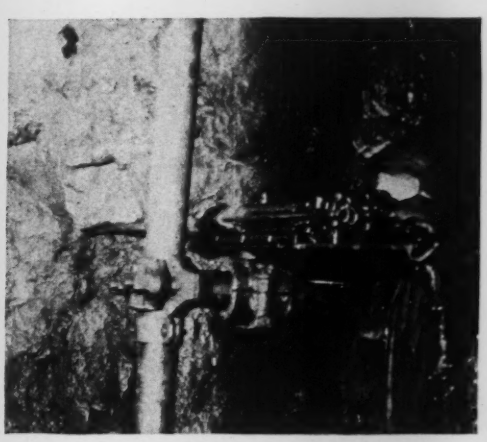
A special breaker point, designed principally for breaking up concrete with pneumatic hammers, has been developed by Sullivan. It is known as the Arropoint (illustrated) and comes in both pick and chisel styles. Arropoint has an enlarged or upset ends which permits a point angle 50 per cent wider than is possible to obtain on conventional steels. At the same time, the length of point is maintained. The wider point angle does more useful work and generates less heat, thus the point lasts longer because the temper is not destroyed by excessive heat. Because of their design, Arropoints rarely stick, as the concrete usually breaks away before the entire head penetrates the mass. This action it is claimed tends to eliminate all flying chips. Both pick and chisel points come in 1-in. 1⅛-in. and 1¼-in. hexagon shapes with shank lengths of 4¼ in. and 6 in. The total length above the collar varies from 14 to 24 in.

Independent Pneumatic Tool Co., Chicago, Ill.

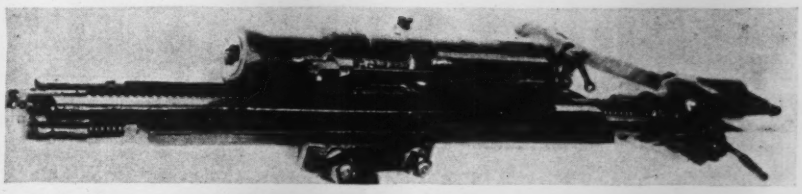
Several new Thor-Cochise pneumatic tools have recently been introduced by Independent. One of these is the new Thor 90 drifter drill with a new automatic feed (illustrated). This drill utilizes a positive air feed which uses very little air, yet feeds the machine forward at a steady rate to produce fast drilling in even the hardest formation. Another new machine is the Thor 25 heavy-duty paving breaker (illustrated) designed and built for hard demolition work. The new Thor 60 backfill tamper employs a new type rocker valve and a direct exhaust, designed to provide a smooth running tool with a rapid, powerful blow. Two new portable pneumatic diggers, the Thor 412 and 432 have also been added to the Independent line. These diggers are light and medium weight tools respectively, and one of their outstanding features is the Thor Pigtail Bumper, a spiral bumper that fits around the shank of the spade as well as inside the retainer body to exclude dirt and grit. In addition, the Pigtail Bumper absorbs vibration of the blow from the collar on the spade. A new machine is the Thor Pipe Driver, designed to drive pipe up to 3 in. in diameter distances up to 100 ft. Sections of pipe up to 22 ft. long can be driven in one time. The driver is mounted on a geared track, and an air-powered hammer drives the pipe while an operator feeds the machine forward with a ratchet handle (illustrated). The machine weighs 305 lb. and can be set up and ready for operation in 17 minutes.

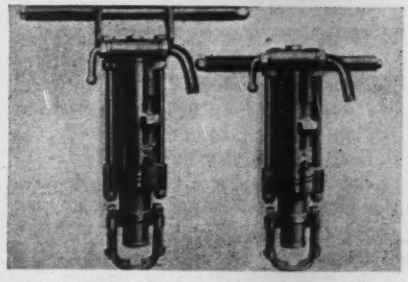


Thor 25 Paving Breaker.

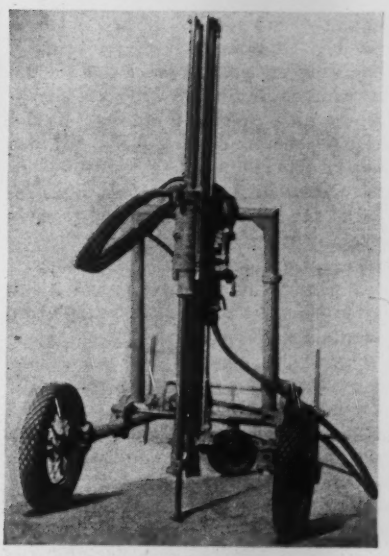


Gardner-Denver AF-89 Auto Feed Drifter Drill.

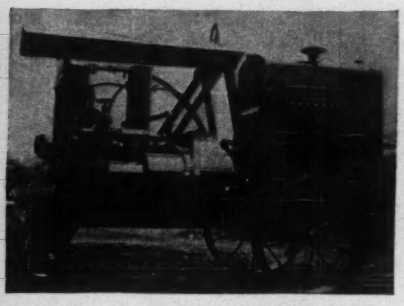




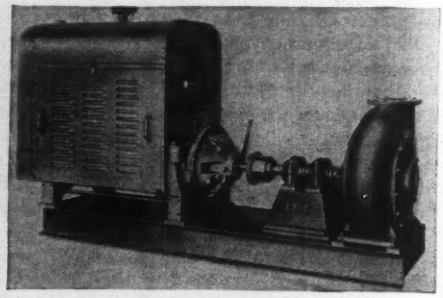
Cleveland H-10 Hand Drills.
Thor Pipe Driver (center).



Cleveland DR-8 Wagon Drill.
Thor Auto-Feed Drifter Drill (top).

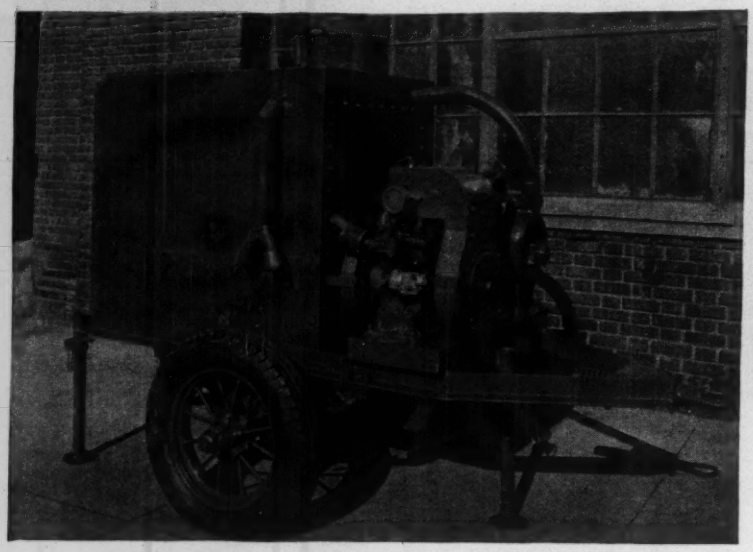


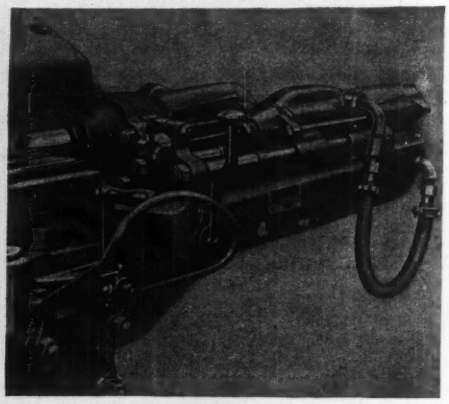
Moretrench Combo Jet-Suction Pump.



Erie Medium-Duty Dredge Pump.

Ingersoll-Rand Thread Forger (left).





Ingersoll-Rand Shank-Bit Punch.

Kadco Drill Dust Collector (left).

Sharpeners

Ingersoll-Rand Co., New York City.

Ingersoll-Rand now has a thread forging device for I-R Jackrods (illustrated). This method of rethreading, consisting of a set of blocks and a die used in connection with the I-R sharpener, which produces a tough thread more resistant to drilling shock, and also greatly reduces the time consumed in the operation. Approximately 5 hr. required for annealing machined threads is completely eliminated by the forging method. Contractors are rethreading 20 rods per hr. by the new process. The device was first used on the Crow Mountain bypass on the Storm King Highway in New York State. Another new development in rock drill sharpening equipment, a new shank and bit punch (illustrated) has just been announced by I-R. New features include convenient location of operating levers, safety guards for the punch and an improved design, facilitating inspection and reducing breakage of punch pins. This punch, on a heavy, bracket is adaptable to all recent I-R sharpeners

Dust Collectors

Kadco Corporation, New York City.

The latest development in the Kadco line of rock-drill dust control apparatus is the 2A special highway trailer-type Kadclone Dust Separator (illustrated). This unit, approved by the New York State Department of Labor for use with two jackhammers, two stope hammers; or one jackhammer and one stope hammer; or one 4-in. bore wagon drill, supplements the Kadco line of 3, 4, 5 and 12-drill units, all having New York State Department of Labor approval and all licensed under U.S. Process Patent No. 2,144,286. The 2A unit includes two exhaust hoods, two exhaust hose lines leading from the hoods to the collector, one Kadclone collector, and a vacuum fan and engine. Any one of several types of Kadco hoods can be used. The Kadclone consists of two stages of separation incorporated in a single rectangular housing and mounted together with the exhauster and engine on a two-wheeled spring-mounted highway trailer on pneumatic tires. The exhauster is driven by a 5-hp. gas engine.

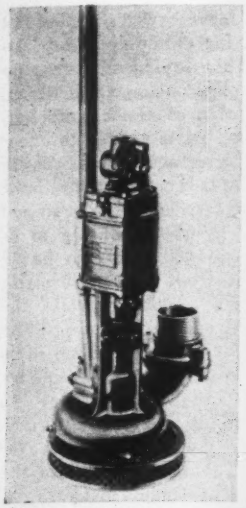
Pumps

Erie Pump & Engine Works, Medina, N. Y.

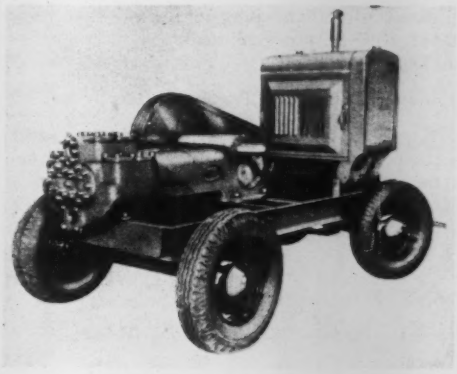
A new line of medium-duty sand and gravel dredge pumps has just been developed by Erie. These pumps are designed for operation against heads up to 100 ft., and are all equipped with Timken bearings. They can be furnished in belt drive or for direct connection to electric motor or gasoline and diesel engines, and come in all sizes from 2-in. to 15-in. discharge; the 6-in. gas engine driven model is illustrated. Direct connected units can be supplied up to and including the 8-in. pump size, but for larger sizes, it is recommended that the pumps be driven with a close-coupled V-belt drive from an engine on a separate base.

Moretrench Corp., New York City.

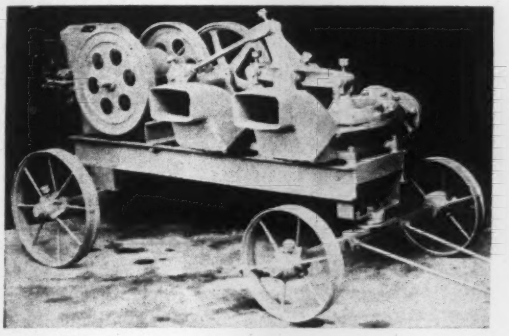
The Moretrench Combo pump is a new combination jet and wellpoint pump (illustrated) recently made available to contractors. This new pump combines all of the pumping features of the



Novo 2-in. Self-Prime Centrifugal.

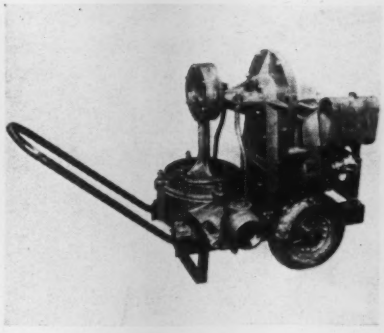


Novo OP Heavy-Duty Pressure Pump.



C. H. & E. 55 Double Diaphragm Pump.

Thor 361-T Sump Pump (top).



Novo 3-in. Diaphragm Pump.

Bingham 35,000-gpm. Pump (right).

regular Moretrench wellpoint pump, and in addition has the advantage of jetting while pumping from wellpoint. With this unit an additional jet pump is no longer needed. It is made in two capacities, 500 and 1,100 g.p.m. and can develop from 90 to 150-lb. pressure.

Novo Engine Co., Lansing, Mich.

That the old reliable diaphragm pump still has a definite place in construction is recognized by Novo in announcing a new light-weight, compact, 3-in. (illustrated) an 4-in. lift an force diaphragm pump. This new pump has completely enclosed gearing and a double-braced eccentric which transmits the power to the pump, replacing the old type walking beam. A 2½ or 3½ hp. air-cooled engine is closely coupled to the pump. The 3-in. pump, skid-mounted, weighs only 370 lb., and it can be mounted on a two-wheel, steel or pneumatic tired truck. Novo also announces a new complete line of self-priming centrifugal pumps from 1½-in. through 8-in. sizes, involving a new principle that eliminates the leaking of air around the seals, which often interferes with priming or cuts down the volume. This is accomplished by a unique design that results in pressure inside of the pump at the seals, rather than a vacuum. To fill in between the medium-duty pressure pump and the Novo road pump, a heavy-duty duplex double-acting pressure pump has just been announced by this company. The pump (illustrated) can be equipped with various liners for changing the capacity from 33 to 95 g.p.m. and pressures from 800 to 300-lb. Power may be gasoline, diesel or electric motor. Novo has also brought out a new close-coupled simplified road pump, incorporating all of the features of the older model but in which the drive has been greatly simplified by direct chain drive from engine to the pump intermediate shaft, eliminating two gears and a drive shaft of the engine. This pump is available in sizes from 80 to 150 g.p.m.

C. H. & E. Mfg. Co., Milwaukee, Wis.

C. H. & E. also believes that diaphragm pumps still have a place in construction, and comes out with a new line of both single and double pumps of this type in 3-in. and 4-in. suction sizes. The No. 55 double diaphragm model, 4-in. in size, is illustrated. The units are mounted on two 4-wheel trucks, steel or pneumatic-tired wheels. All models can be easily converted from open spout discharge to closed lift and forced discharge. Suction valve, water box and discharge valve are ranged in a straight line so that solids can be carried through the pump with the flow of water. Power is supplied by various types of gas engines.

Independent Pneumatic Tool Co., Chicago, Ill.

A new portable non-freezing sump pump, air-operated, the Thor 361-T (illustrated) includes two innovations. One is that eddy currents are prevented at the point of exhaust with the result that the usual secondary compression of air at this point is eliminated and the cause of freezing removed, and the other is an automatic lubricator, actuated by live air pressure, which provides the continuous application of high pressure grease between the working impeller hub and the impeller bushing. This model has a total head of 90 ft. at 90-lb. air pressure and under these conditions will discharge 42 g.p.m. It can also be

obtained in tandem with a total head of 160 ft. at 90-lb. pressure.

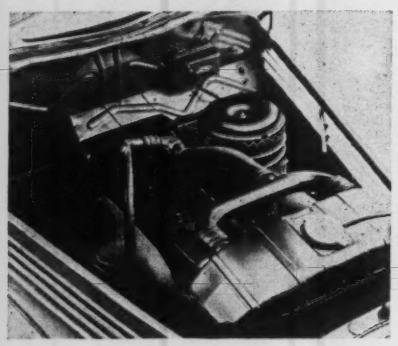
Bingham Pump Co., Portland, Ore.

New design of propeller pump capable of delivering large quantities of water at heads up to 75 ft. has been developed by Bingham (illustrated). The new design increases the pump efficiency by 25 per cent, and the new pump has an unusually flat horsepower characteristic throughout the entire operating range. Three of the pumps, with a capacity of 65,000 g.p.m. are already in service.

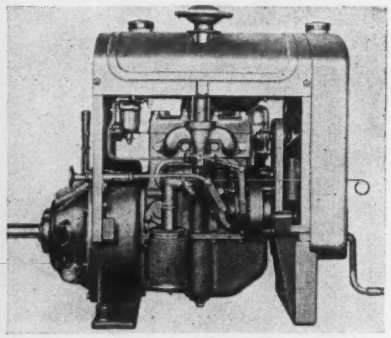
Power Plants

Hercules Motors Corp., Canton, Ohio.

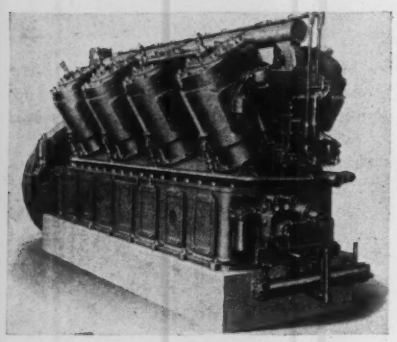
New developments in the Hercules list of engines and power plants include four-cylinder diesels and 2, 4 and 6-cylinder gas engines. One item that has aroused a lot of interest, both here and abroad, is a four-cylinder diesel replacement for Ford trucks, available for both cab-over-engine and conventional models for the years 1935–1939 inclusive, and for either right or left-hand drive. This replacement engine features a complete package unit which, with the exception of muffler and battery, includes all parts needed to effect a complete change-over from gas to diesel operation. It is compact, and built for heavy-duty service. It is equipped with a special fly-wheel housing to fit the Ford transmission and also has a special type of front gear cover with supporting arms which duplicate the Ford V-8 front engine mounting. The replacement unit is shown in two illustrations on this page. Hercules has recently brought out a two-cylinder gas engine, Model BXB, and a series of two-cylinder heavy duty gas engines for power units. This last comprises the NX series, and are made in two sizes, NXA and NXB (illustrated). These develop 12.4 and 14.4 hp., respectively. Special attention has been paid to cooling of valves to compensate for high speed operation.



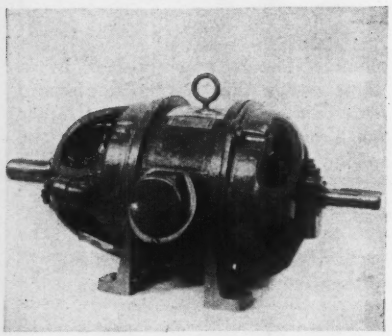
Hercules Diesel in Ford Truck.



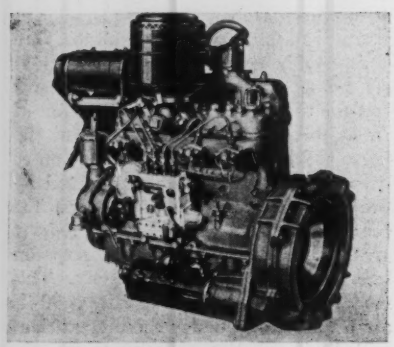
Hercules Two-Cylinder Gas Engine.



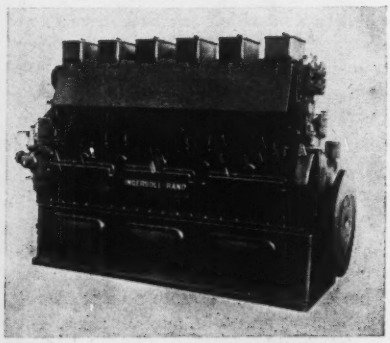
Ingersoll-Rand PVG 8-Cyl. Gas Engine.



Westinghouse Crane and Hoist Motor.



Hercules Diesel Ford Truck Engine.



Ingersoll-Rand 6-Cyl. Type S Diesel

Ingersoll-Rand Co., New York City.

Late last fall I-R announced its new Type S diesel engine (illustrated). This unit is a heavy-duty continuous-service compact engine for stationary or marine electric application. It is a 4-cycle, single-acting, solid injection engine of inclosed type, having complete force-feed lubrication, wet liners, shell bearings and other refinements. The Type S is built in sizes of 3, 4, 5, 6, 7, and 8-cylinders, rated at 75, 230, 290, 350, 405 and 460 hp. respectively, at 600 r.p.m. I-R also came out last year with a new PVG gas engine (illustrated). This engine operates on gas as a fuel, not gasoline. It is a 4-cycle, V-type multi-cylinder unit built for continuous full load operation at the moderate speed of 400 r.p.m. It is available in 3 sizes of four cylinders at 185-hp., 6 cylinders at 275-hp. and 8 cylinders at 370-hp.

Sterling Machinery Corp., Kansas City, Mo.

Sterling announces its new Unitype electric generating plant, available in units ranging in size from 100 watts, 6 volts up to 1,500 watts 110 volts, in both alternating and direct current. These plants are compact, light in weight, and are adaptable for use in construction camps, for mounting on cranes and shovels and other similar installations.

LeRoi Co., Milwaukee, Wis.

The new D176 series of power units (illustrated) is the latest development in LeRoi engines. The engine used in this power unit is of new design, equipped with removable wet cylinder sleeve and hardened molybdenum

chromium steel exhaust valve seat inserts. Unusual in engines of this size, is the overhead valve arrangement instead of the customary L-head arrangement.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

A special line of motors designed to meet exacting electrical and mechanical requirements of hoist and crane service, has been developed by Westinghouse. Known at Type CI, these motors have intermittent rating of 1 to 200 hp. and are designed for operation at commercial frequencies and voltages. They feature sturdy construction, sealed sleeve bearings, thorough insulation and a rigorous radial frequency test, which proves the insulation of every turn of wire in the coil. One of these units is illustrated on the preceding page.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Allis-Chalmers has added the B15 gasoline power units (illustrated) to the for models already manufactured. The new unit is a small 4-cylinder valve in head engine rated at 15 hp. All parts of the engine are lubricated by forced-feed, cooling is effected by a fan-belt-driven circulating pump, and cylinder liners are removable.

Novo Engine Co., Lansing, Mich.

A complete new line of heavy-duty industrial power units has just been put on the market by Novo, consisting of six models. The list includes a single-cylinder water-cooled 5 to 7 hp., two 2-cylinder water-cooled models, ranging from 5 to 11 hp., and two 4-cylinder water-cooled models ranging from 10 to 22 hp. A 4-cylinder model is illustrated. They all have extra heavy crankshafts and large roller and ball bearings on the crank and cam shafts. They are positively oiled by the Novo gear oiler.

Witte Engineering Works, Kansas City, Mo.

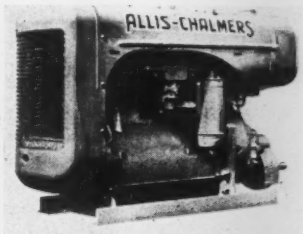
Witte is producing a line of streamlined Dieselelectric generating plants in both horizontal (illustrated) and vertical types. They are available in a range of sizes from 4 hp. to 12 hp. The engines are full diesel, four cycles, cold-starting with forced-feed lubrication and Timken roller bearings.

D. W. Onan & Sons, Minneapolis, Minn.

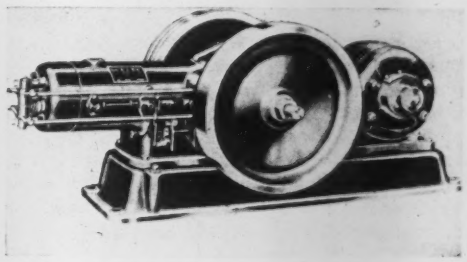
New models of a 2,000 and 3,000-watt water-cooled a.c. generating units have been announced by Onan. These are powered by 2-cylinder 4-cycle engines, and the generator produces 110-volt 60-cycle a.c. current with closely regulated voltage and frequency. Both models, W2F (illustrated) and W3F are offered in manual, self-starting and full automatic starting types.

Waukesha Motor Co., Waukesha, Wis.

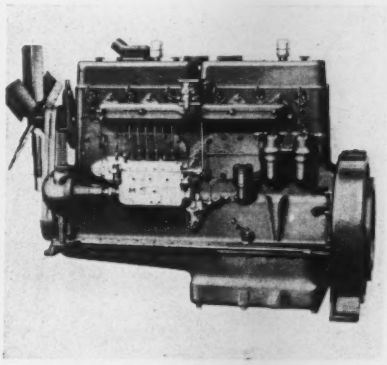
A list of new Waukesha products of interest in the construction field includes four new gasoline engines—a small 4-cylinder for pumps, lighting sets and slight portable power units, ranging from 8½ hp.; 6-cylinder for machinery requiring 150 to 174 hp.; and a similar 6-cylinder engine for heavier units needing 160 to 180 hp. There is also another Super Six in the gasoline field developing 200 to 225 hp. The small engines feature L-heads; the 6-cylinder engines are all of the overhead valve type with controlled turbulent combustion chambers, removable and renewable wet sleeve cylinder liners and 7-bearing chankshafts. Waukesha also has an improved line of Hesselman oil engines, to include all sizes from 20 hp. to 300 hp. (Model WAKH illustrated). The Hesselman engine is not a high-pressure unit, but its compression pressure is the same as gasoline engines, 120 to 130 lb. per sq.in. It has electric spark ignition. Latest developments in the Hesselman engine are 150 to 175 hp. and 165 to 180-hp. units, designed especially for small power shovels.



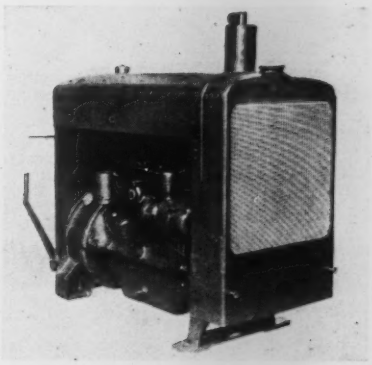
Allis-Chalmers 4-Cyl. Power Unit.



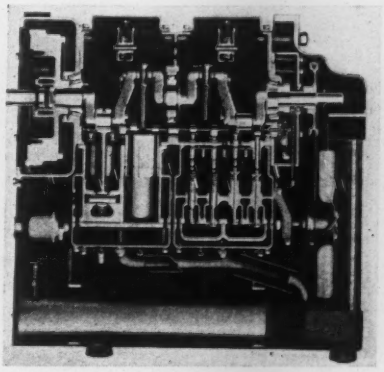
Witte Dieselelectric Plant.



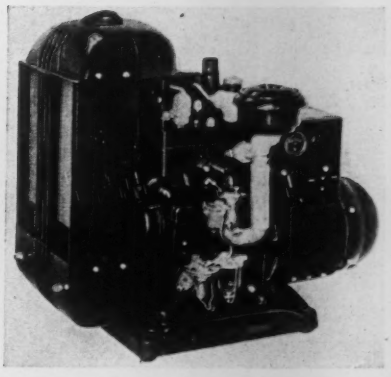
Waukesha-Hesselman 6-Cyl. Oil Engine.



LeRoi D-176 Power Unit.



Novo CW 4-Cyl. Engine.



Onan Gas-Driven Generating Plant.

Welding

Harnischfeger Corp., Milwaukee, Wis.

The Hansen 200-amp. Special Arc Welder (illustrated) has been designed to meet the contractors' demand for an engine-driven welder with a wider operating range than the average 150-amp. unit, yet at a lower price than the standard 200-amp. unit. It consists of a 200-amp. commercial rated 30-volt 6-kw. generator with an intermittent welding range of 35 amp. to a maximum of 225 amp. The generator is connected by a flexible coupling to a 24-hp., 4 cylinder, water-cooled gasoline engine.

Lincoln Electric Co., Cleveland, O.

The new Shield-Arc Welders recently announced by Lincoln provide greater convenience and accuracy through a new self-indicating dual continuous control. These welders (illustrated) have both job selector and current controls calibrated and equipped with dials which indicate the type of work and the number of amperes for each and every setting. Another feature of this welder control is that both voltage control and current control are continuous in operation. These welders are available in a.c. and d.c. motor drive, belted or coupled, and gas engine drive in all standard ratings. Lincoln has also just brought out a new diesel engine-driven arc welder (illustrated) built to Lincoln specifications. The arc welding generator used on this set is a new 300 amp. Shield-Arc SAE unit equipped with dual continuous control. Lincoln has also designed a new electrode for fillet welding, the Fleetweld 8.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

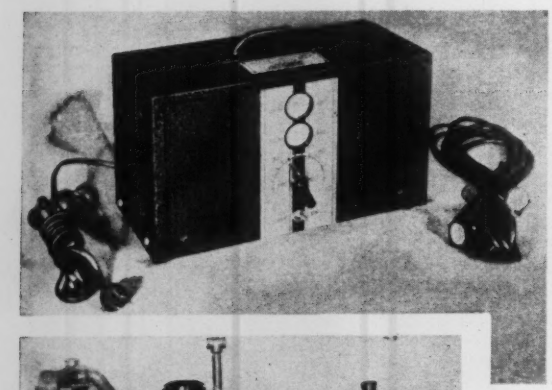
The new Flex Arc Model F5A 200-amp. gas engine-driven welder (illustrated) is completely equipped with governor, hydraulic idling device, current indicator, polarity reversing switch, oil filter and battery starter. It is a lightweight and compact unit. This welding generator varies the current output by means of a magnetic shunt in the armature reaction flux path, and the current output adjustment is mechanical. Westinghouse has also just announced the Flex Arc welding cable, flexible, durable, light in weight and positively insulated.

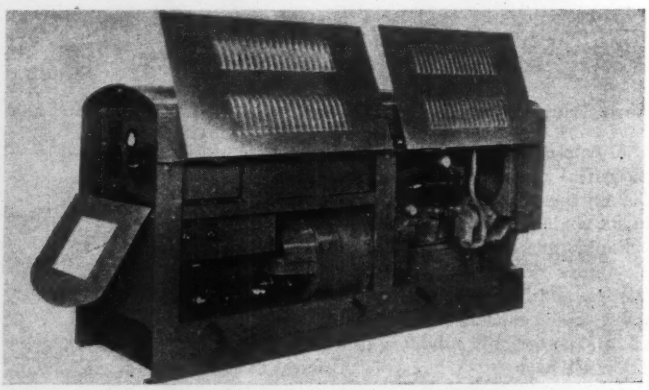
General Electric Co., Schenectady, N.Y.

The latest contribution to the welding field by G.E. is the new Type W22E electrode and the GE tellerium compound arc welding cable. The illustration shows these units used on the Chicago River Lock job in Chicago.

A. O. Smith Corp., Milwaukee, Wis.

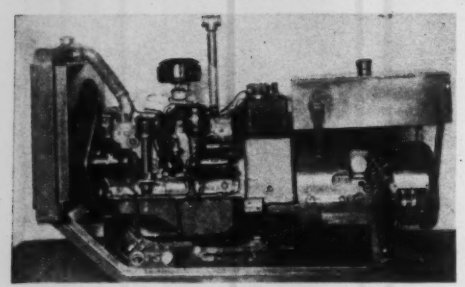
The Arc-Length Monitor (illustrated) is a new welding control developed by Smith. The device functions as follows: The welder is informed of the length of his arc by two tiny bulbs, mounted inside his welding helmet, one on each side of the window through which he observes the arc. Both bulbs are normally dark at the selected voltage. The one to the right glows faintly and with increased intensity as the voltage increases from that selected; the one to the left responds similarly as the voltage decreases from that selected. The instrument itself also contains signal lights similar to those in the helmet.



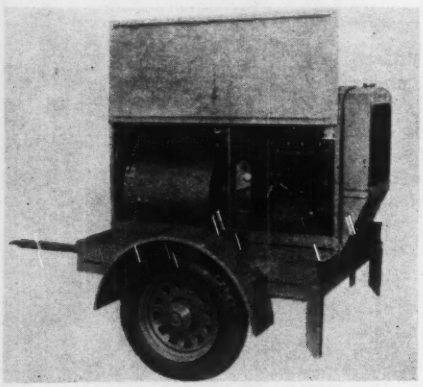


Lincoln Diesel-Driven 300-Amp. Welder.

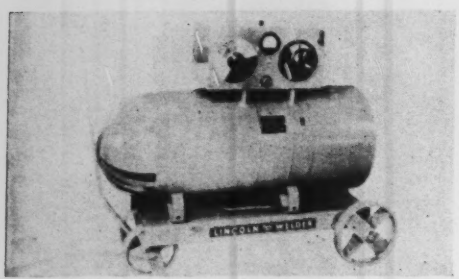
A. O. Smith Arc-Length Monitor (upper left).



Westinghouse Engine-Driven Welder.



Hansen 200-Amp. Special Arc Welder. G. E. W22E Electrodes.



Lincold Shield-Arc Welder with Shield Control (left).

Hoists

Jaeger Machine Co., Columbus, O.

Embodied in the latest Jaeger line of hoists ranging in size up to 100 hp., is the same principle of self-energizing giant expanding frictions and clutches that is used on the higher priced shovels and cranes. As a result, a finger pressure of 4 to 10 lb. is all that is required to operate the controls. Another Jaeger hoist feature is the use of anti-friction bearings for supporting the balanced drum. On the Utility Hoist (illustrated) which ranges in size from 30 to 50 hp., additional drums up to three may be added merely by bolting sections to a jig-drilled frame, using the single-drum hoist.

C. H. & E. Mfg. Co., Milwaukee, Wis.

The C. H. & E. No. 3 Hitch-Hiker hoist (illustrated) is a new development in the hoisting field. This hoist consists of two winch heads or niggerheads driven through an inclosed worm gear reduction by a gasoline engine or electric motor. All clutches, brakes and usual hoisting mechanisms have been eliminated. The Hitch-Hiker is operated by wrapping the hoisting rope several times around one of the winch heads.

Clyde Iron Works, Duluth, Minn.

The most recent development in the Clyde line of hoisting equipment is a new all-purpose gasoline hoist (illustrated) that has three speeds available on both drums. The variation of speeds and loads is obtained through a simple clutch and gear shift. Power is obtained through an 85-hp. V-8 gasoline engine. The complete unit is built on a one-piece all-steel jig frame, including bearings and stand.

Beebe Bros., Seattle, Wash.

The Beebe hoist line has been expanded to include sizes covering the full range of hand hoisting requirements. All Beebe hoists are hand-powered and are equipped with a positive brake that will either stop the load or break the rigging. The most popular model has been the 5-ton General Utility, though the 15-ton triple-gear unit is now doing handling jobs formerly considered possible only with a power hoist.

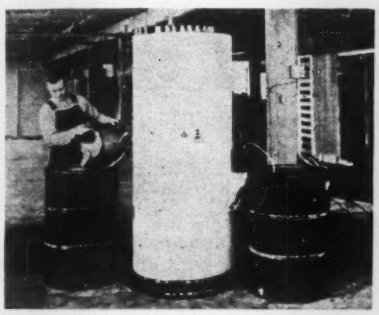
General Electric Co., Schenectady, N.Y.

To save contractors trouble in setting up hoist control apparatus for the Delaware River aqueduct tunnel job, G. E. has built into one compact unit all of the various components for hoist control, such as high voltage panels, transformer, contactor panels, resistors, etc., for 300, 400 and 500-hp. hoist outfits. The control apparatus requires only connecting up to the hoist motors and the power supply before being ready to function.

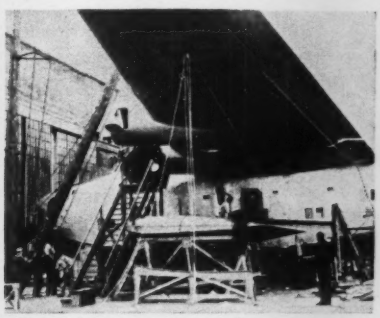
Miscellaneous Items

Bucyrus-Erie Co., So. Milwaukee, Wis.

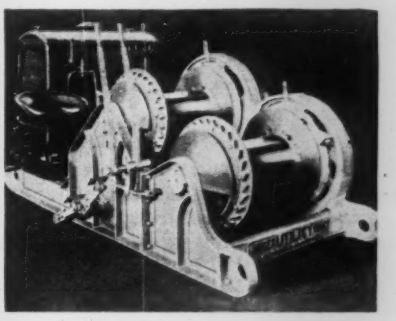
An oil filter that thoroughly cleans and makes old oil ready for use again by simple warming, washing and filtering processes at an average cost of 9c. per gallon has been put out by Bucyrus. The filter (illustrated) is electrically-operated and semi-automatic. Bucyrus-Erie has also developed



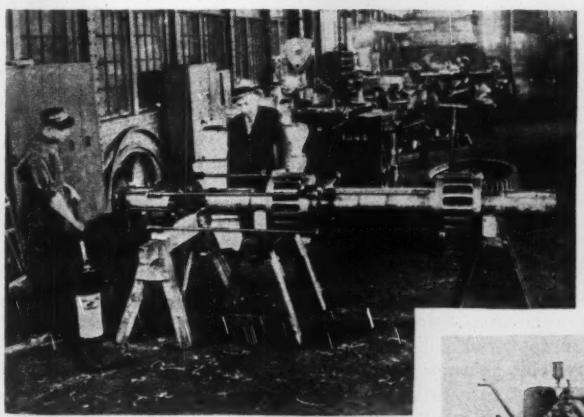
Bucyrus-Erie Oil Filter.



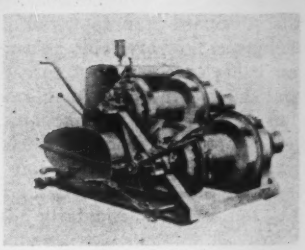
Beebe Hand Hoist on Boeing Clipper.



Jaeger Utility Hoist.

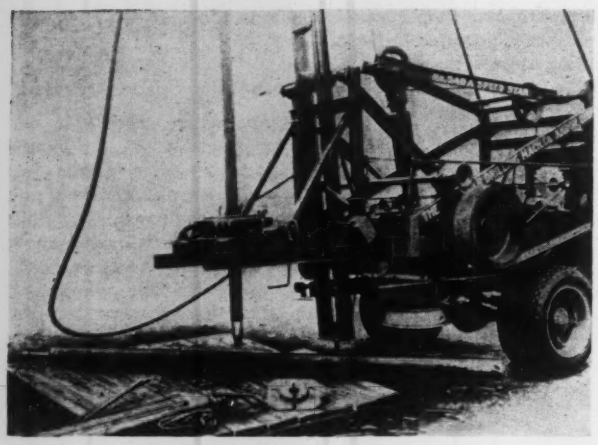


Bucyrus-Erie Hydraulic Press for Field Equipment Repairs.

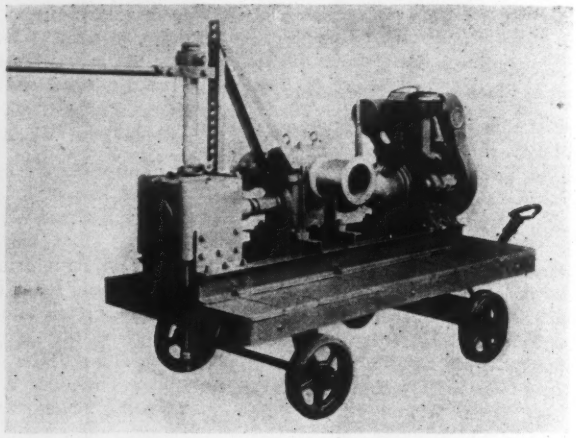


C. H. & E. Hitch-Hiker Hoist.

Clyde Three-in-One Hoist (left).

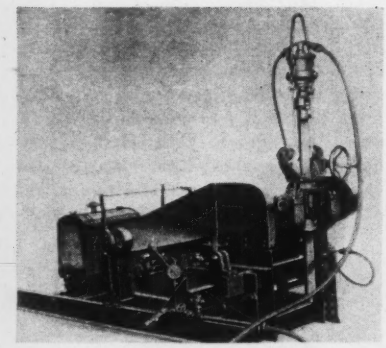


Star Shot Core Drilling Machine.

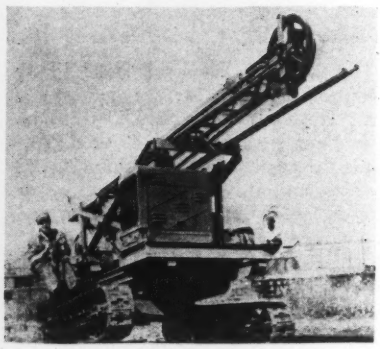


Acker Core Drill.

Buda-Hubron Earth Drill.



Ingersoll-Rand Calyx Core Drill.



Star 71 Crawler Drill Rig.

the Beco portable hydraulic press (illustrated) used for dismantling and repairing heavy construction equipment in the field. It is built in three sizes, 100 tons, 150 tons, and 225 tons and can be used as a puller, press or jack.

Acker Drill Co., Scranton, Pa.

Acker has a new design in core drills (illustrated) differing from the previous type in that there are no feed gears, hydraulic cylinders, or racks and pinions. The downward feed and travel is accomplished through a cushioned hand lever. The new drill is used for making test cores in concrete highways, for drilling mudjack and grout holes and for sampling rock. It is mounted on a small motor truck, a hand trailer or on skids.

Buda Co., Harvey, Ill.

A new model Buda-Hubron earth drill has been developed which will drill a 24-in. hole 24 ft. deep in fast time. The drill is a complete unit, with its own gasoline engine. It can be mounted on a standard 1½ ton truck (illustrated) or on a railroad push car. The drill itself is mounted on a subbase adjustable 15 deg. in any direction in order to assure perpendicular holes when the truck is standing on uneven ground. The engine is provided with two clutches, one to revolve the drill and the other to lift the drill and its load of earth from the hole.

Ingersoll-Rand Co., New York City

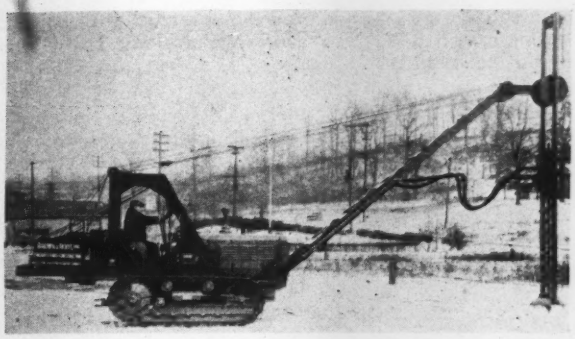
The I-R line of Calyx core drills now includes 17 models for all classes of service, including laboratory testing, highway testing, mine and tunnel ventilation, shaft drilling, foundation systems, well drilling, water-front construction and wire-saw equipment. The latest type drill is illustrated on this page, and drills are available in sizes from 2¼ in. to 72 in. in diameter.

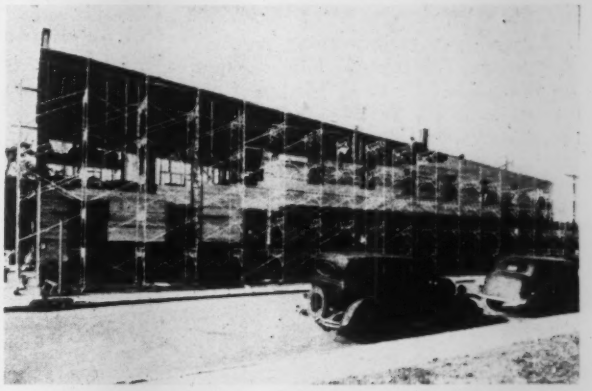
Star Drilling Machine Co., Akron, O.

Star has developed three new drills of interest to the construction field. The No. 240 Speed Star waterwell drilling machine is now available as a combination cable tool and shot core drill (illustrated) and the rotary cable units used for core drilling may be quickly attached or detached from the machine. The water pump is mounted on the machine and the entire unit is carried on a 1½ ton truck. Particularly adaptable to quarry and heavy construction blast hole work is the new No. 71 FT Star drilling machine (illustrated) mounted on three-point suspension crawler tracks for traveling over rough ground. The machine is so designed that it may be moved with the mast raised in drilling position. A third new Star drill is the No. 73 Spudrill, an all-steel drilling machine for heavy-duty waterwell work. It is portable, built for fast moving. This drill will bore holes up to 2,000 ft. deep, starting with a 30-in. diameter, and will handle tools up to 3,600 lb.

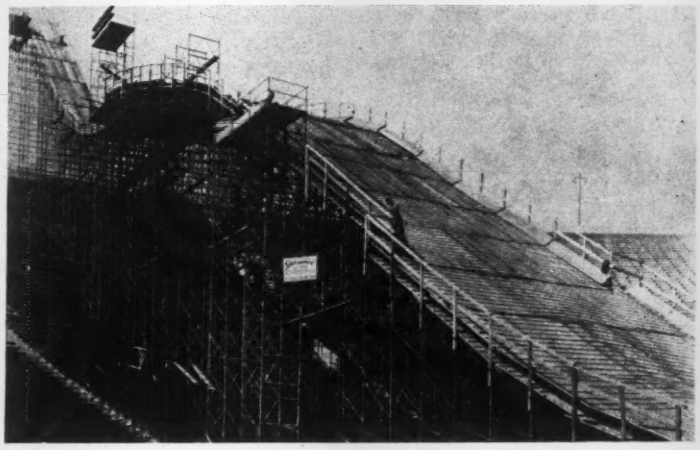
Atlas Powder Co., Wilmington, Del.

Atlas announces a waterproof galvanometer for testing electric blasting caps and electric circuits in blasting work. In addition to its resistance to water and moisture, the new device is in a non-corrosive case, has a higher factor of safety and a longer cell life, a separate cell compartment and a new type leather cover. Atlas also announces a new Manasite blasting cap, both fuse and electric types. They are safer through the use of a new initiating compound, which effects a substantial reduction in the sensitivity to external shock and friction.

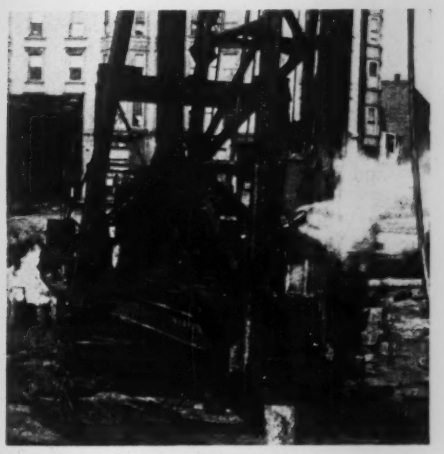




Hughes-Keenan Hydraulic Earthworm.
Chesebro-Whitman Trouble-Saver Scaffold (right).



Safway Scaffold Ski Slide at Los Angeles.



Super-Vulcan Open Pile Hammer.

Chesebro, Whitman Co., New York City

This firm announces that it has added the Trouble-Saver line of steel scaffolding, developed by the Steel Scaffolding Co. of Evansville, Ind., to its list of steel and wood scaffolding. This new design of steel scaffolding consists of tubular steel bents braced at the top by a truss frame and built up into towers or running scaffolds by diagonal braces bolted to the vertical members. Various accessories permit building of guard rails, extending the scaffold to any height desired, and adjusting platforms to any desired level.

Safway Steel Scaffold Co., Milwaukee, Wis.

Safway steel scaffolding is now adaptable to many uses outside of the customary building and decoration jobs, as can be seen in the accompanying photograph of a tubular steel ski slide erected in the Los Angeles Coliseum. Safway also builds grandstands and large platforms from its scaffolding. The scaffold units are simple, consisting of a tubular frame 5x5 ft., which can be fabricated into bents of any height with cross bracing that spaces the bents 7 ft. apart. A complete section is made by slipping the cross bracing over welded screws in the frame, and tightening by means of thumb nuts.

National Colortype Co., Bellevue, Ky.

National is meeting the trend toward off-the-road highway marking by the Fireball swivel type roadside marker. This consists of a round steel rod fastened to the top of a post which carries the marker unit. The markers can be set at any angle with the road for varying highway conditions. Each marker consists of three reflecting units 1⅝ in. in diameter, available in several colors.

Highway Safety Products Co., New York City

Highway Safety has a new traffic line marking machine and glass sphere dispenser for installation of the refractolite process of highway traffic line marking. This process consists of embedding tiny glass spheres in fresh paint of the traffic strip. At night the lines become luminous by refracting and reflecting the rays from automobile headlights. The refractolite process is now also being applied to warning and direction signs, narrow bridges, and other roadside hazards.

Hughes-Keenan, Mansfield, Ohio

The Hydraulic Earth Worm is a new earth drill mounted on a tractor and equipped with a boom to enable the drill to reach 20 ft. from the front end of the tractor over ditches and fences and into other difficult places (illustrated). It will bore holes up to 16 in. in diameter to a depth of 7 ft. Although the leads are designed to hang plumb no matter what position the tractor and boom may be in, they can be tilted to drill holes at any angle.

Vulcan Iron Works, Chicago, Ill.

For contractors who prefer a steam pile driving hammer with the working parts exposed, Vulcan is now offering an open-style Super-Vulcan differential-acting pile hammer in addition to the closed type, which has been available for some time. All of the characteristics of the closed type are identical in the open type for the same energy rating. Compressed air may be used instead of steam without change in the hammer or working pressure.

Reed-Prentice Corp., Worcester, Mass.

A new gas engine-driven portable timber saw (illustrated) has been put on the market by Reed-Prentice. It is available in 16, 24 and 36 in. sizes, weighing 75, 80 and 95 lb. respectively. Saw chain, frame and drive units are interchangeable with the standard Reed-Prentice electric and air drive saws. The engine is two cylinder horizontal opposed four cycle air cooled type, developing 5 hp. at 2,800 r.p.m.

Syntron Co., Homer City, Pa.

A portable electric saw of 2-in. cutting capacity has been added to the Syntron line of tools (illustrated). Features include tilting base for bevel cuts, oversized universal electric motor, double pole, silent worm gear drive and automatic telescoping safety guard. It weights 18 lb. and standard equipment includes a 6½-in. combination rip and crosscut saw blade.

Mall Tool Co., Chicago, Ill.

Mall has just come out with an improved Model 1B electric hand saw (illustrated) of 2¾-in. cutting capacity. An all metal carrying case is furnished for transporting this handy little tool from job to job.

General Electric Co., Schenectady, N.Y.

An electric magnetic thickness gage for measuring the thickness of enamel coatings on steel water pipe (illustrated) is now made by G.E. It was developed by Harry Hayes of the water department of Los Angeles. The inspector holds the head of the instrument against the rotating pipe in the enameling rack and a dial reading gives a continuous indication of enamel thickness. G.E.'s new soil heating cable has been adapted to heating curing chambers for concrete testing samples (illustrated).

Hamilton Mfg. Co., Two Rivers, Wis.

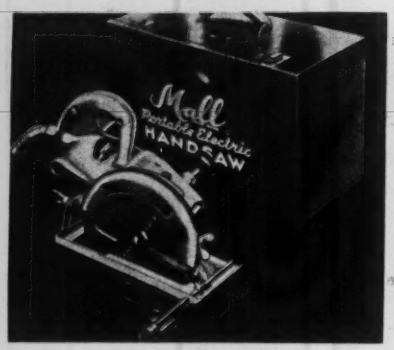
Three new items developed by Hamilton during the past year include the auto shift drawing cable (illustrated); the Hamilton-Calumet tracing lifter device for shallow drawers, filing of blueprints and tracings; and a new mobile formica-lumarith straight edge. The auto shift drawing board is adjustable as to height and slope. The tracing lifter makes every tracing as easy to file as the top sheet. The new straight edge is made of formica and lumarith instead of wood and celluloid, and comes in blade sizes from 30 in. to 120 in. long.

Lufkin Rule Co., Saginaw, Mich.

A folding end hook of new pattern for woven tapes is offered by Lufkin (illustrated). It permits the taking of many measurements unassisted.

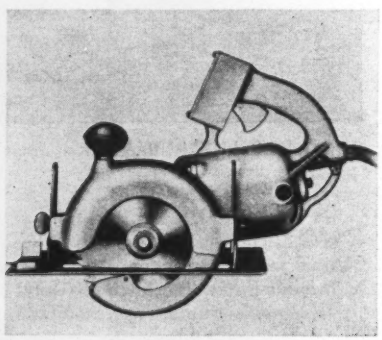
Barco Mfg. Co., Chicago, Ill.

The new Barco gasoline hammer is a one-man tool, powered by an air-cooled two cycle single cylinder gas engine and strikes 1,500 blows per min. Electrical energy for ignition is supplied from a dry battery and coil located in a separate battery box, connected to the hammer at the handle. Tools that work with the Barco hammer include a spade, asphalt cutter, gad, point, sheathing driver, drill and tamper.



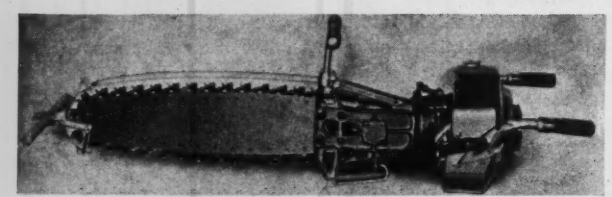
Mall 1B Electric Handsaw.

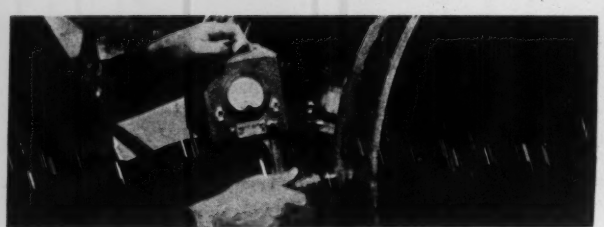
Reed-Prentice Gasoline Saw (below).



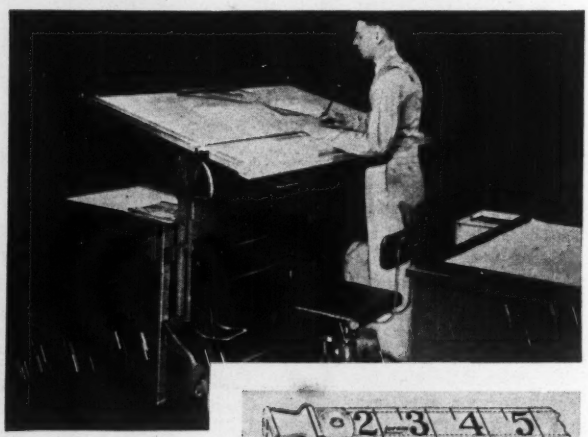
Syntron Portable Electric Saw.

G. E. Soil Heating Cable (left).

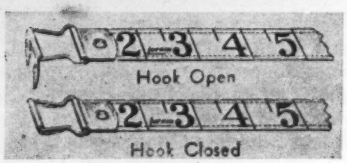




General Electric Enamel Coating Tester.

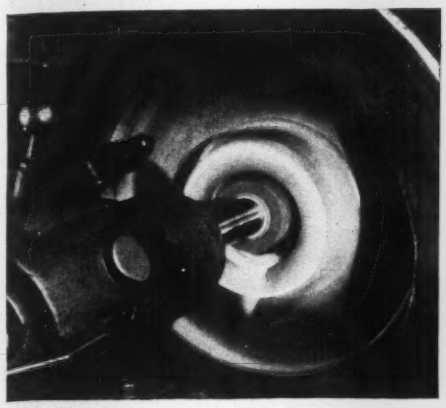


Hamilton Adjustable Drawing Board

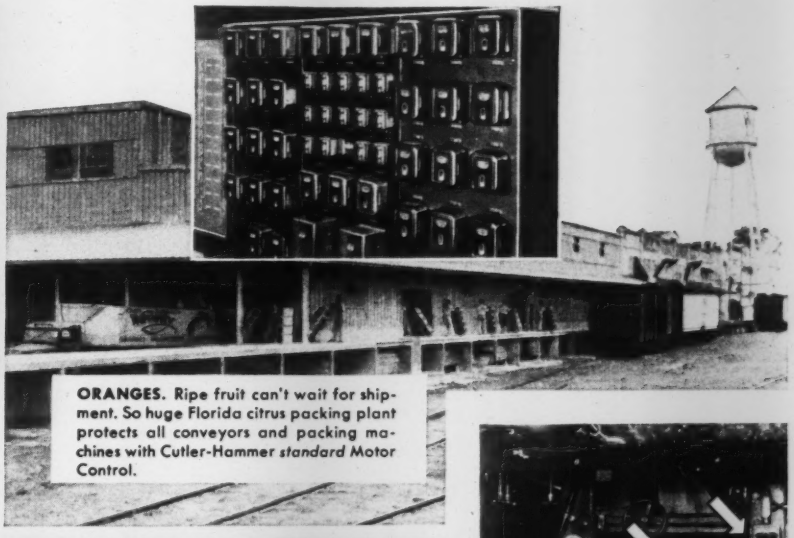


(center). Lufkin Hook-End Tape (right).

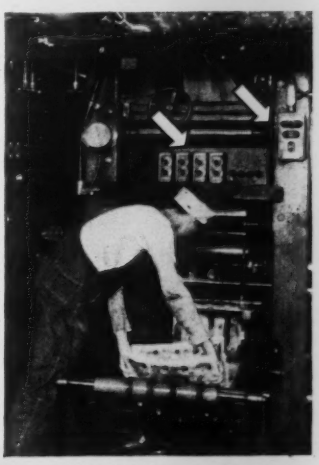
IT HAD TO BE GOOD TO WIN SUCH PREFERENCE



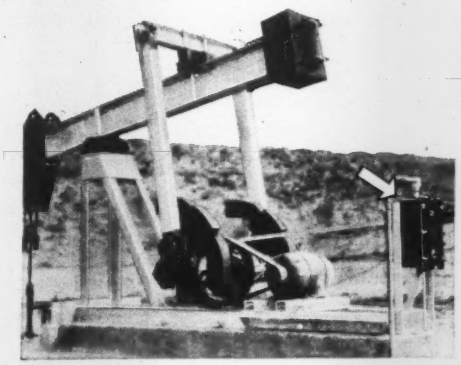
NO SHUTDOWN. Users of electric power vote unfailing operation as *most* important. Loss due to any single production delay usually exceeds entire cost of good Motor Control.



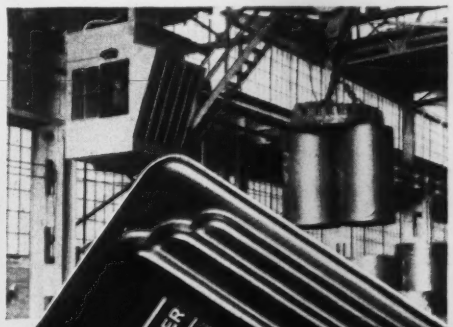
ORANGES. Ripe fruit can't wait for shipment. So huge Florida citrus packing plant protects all conveyors and packing machines with Cutler-Hammer *standard* Motor Control.

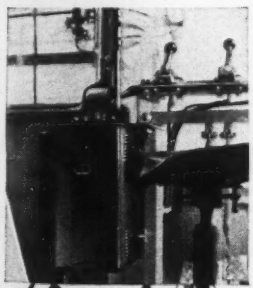


NEWS. World's most perishable commodity. So first choice of newspaper plants is Cutler-Hammer Motor Control.

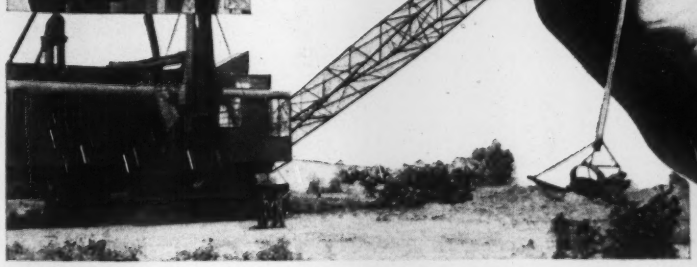


OIL. Modern pumper on 2300 ft. Texas well protected by Cutler-Hammer *standard* Motor Control for dependable performance in isolated location.





GIANT. The investment in this mammoth crane is protected by the use of *genuine* Cutler-Hammer Motor Control as specified.



Experts specify Cutler-Hammer

ELECTRICAL EXPERTS are not fooled by pseudo-engineering or trick features. They judge Motor Control on performance, not on claims. Every piece of Cutler-Hammer *standard* Motor Control shows evidence of the broad special engineering experience that produced it.

©1939, Cutler-Hammer, Inc., 1261 St. Paul Ave., Milwaukee

MATERIALS AND LABOR PRICES

Market quotations on construction materials and wage rates reported monthly by ENR correspondents

MARCH construction material prices show little change from those reported for February. Short Leaf Southern Pine is $1.00 lower on all sizes in Atlanta, and 50c. to $1.00 lower on most sizes in St. Louis, but up $1.00 to $2.00 in Chicago. Douglas Fir prices are up $1.00 to $2.00 in Chicago. Long Leaf Yellow Pine 12 x 12-in. timbers are $10.00 higher in Chicago, $3.00 higher in Detroit, and 50c. higher in Atlanta.

Seattle base price of Douglas Fir concrete form grade plywood, 48 x 96-in., is now quoted at $73.00 for 5/8-in. size, and $81.00 for 3/4-in. size. Former charges of $2.50 per 1000 sq. ft. for oil treatment and $1.00 for paint-sealing the edges are included in the new basis of quoting.

Portland cement is 5c. per barrel lower in New York, dropping back to the January levels. Sand, gravel and crushed stone prices are 58c. per cu. yd. lower in Los Angeles. Ready-mixed concrete is off 25c. per cu. yd. in Baltimore, off 65c. in Los Angeles, but up 20c. in Minneapolis due to heating charge.

Carpenters' rates in Cincinnati, formerly ranging from 70c. to $1.35 per hour now range from 70c. to $1.45; structural iron workers rates are 12½c. per hour higher; and hoisting engineers rates now range from $1.00 to $1.525 per hour.

CEMENT, AGGREGATES, READY-MIXED CONCRETE—F.O.B. CITY

	PORTLAND CEMENT			SAND AND GRAVEL			CRUSHED STONE		CRUSHED SLAG		CONCRETE
	Per bbl., carload lots, including 40c per bbl. for bags, cash discount not included			Per ton, carload lots			Per ton, carload lots		Per ton, carload lots, f.o.b. plant		Ready Mixed 1:2:4, 50 c.y. or more, delivered
	Cloth Bags*a*	Paper Bags	Bulk	Gravel, 1½ in.	Gravel, ¾ in.	Sand	1½ in.	¾ in.	1½ in.	¾ in.	
Atlanta	$1.90	$2.65	$2.60	$1.75	$1.85	$1.95	$1.65	$1.75	$1.55	$1.65	$7.75
Baltimore	2.31	2.06	1.91	1.75‡	1.75‡	1.25‡	1.75‡	1.75‡	1.75‡	1.75‡	6.75
Birmingham	2.55	2.30	1.99	1.80	1.80	1.45	1.00	1.00	.90	1.15	5.45
Boston	2.75*b*	2.50*b*	2.30	1.10	1.10	.80	1.10	1.10	....	....	6.75*m*
Chicago	2.60	2.35	2.20	2.00‡*d*	2.00‡*d*	2.00‡*d*	2.00‡*d*	2.00‡*d*	1.25‡	1.25‡	....
Cincinnati	2.47	2.22	2.07	1.20	1.20	1.30	1.80	1.80	....	....	6.60
Cleveland	1.95	1.70	....	1.45*i*	1.45*i*	1.45*i*	1.70*i*	1.70*i*	1.70*i*	1.70*i*	6.65*i*
Dallas	2.30	2.05	1.85	2.00*p*	2.00*p*	1.50*p*	1.69*p*	1.84*p*	....	....	6.40
Denver	3.02	2.77	....	1.20	1.40	.90	....	....	....	....	7.25
Detroit	2.15	1.90	1.70	1.05	1.15	.85	1.45	1.45	1.65‡	1.65‡	6.50
Kansas City	2.56	2.31	2.16	1.85	2.30	1.00	1.91	1.91	....	....	7.90*n*
Los Angeles	2.82*b*	2.62*b*	....	1.10	1.10	1.10	1.10*f*	1.10*f*	....	....	6.35
Minneapolis	3.00	2.75	....	1.00*h*	1.00*h*	.25*h*	1.00*h*	1.00*h*	....	....	7.60*j*
Montreal	....	....	1.58	....	....	1.25‡	.90‡*c*	1.00‡*c*	....	....	7.60*l*
New Orleans	2.41	2.16	....	1.50	1.50	1.25	....	....	....	....	7.25
New York	2.55‡	2.30‡	....	1.40*de*	1.40*de*	.90*de*	1.65*de*	1.75*de*	....	....	7.25
Philadelphia	2.32	2.07	1.87	1.55‡	1.65‡	1.25‡	....	....	1.00	1.00	7.95*k*
Pittsburgh	2.44	2.19	1.99	1.80‡	1.80‡	2.10‡	2.25‡	2.25‡	1.50	1.50	8.75
St. Louis	2.55	2.30	....	1.50‡	1.50‡	1.25/1.50‡	.85*h*	.85*h*	.75*g*	.75*g*	7.50
San Francisco	2.72	2.52	2.20	1.35	1.35	1.35	1.50	1.50	....	....	7.50
Seattle	3.10*o*	2.85*o*	....	1.17*o*	1.17*o*	1.17*o*	1.33*o*	1.33*o*	....	....	7.30*o*

‡ Delivered. *a* 10c. allowed for each returnable bag. *b* 10c. per bbl. off for cash. *c* Plus municipal tax. *d* Per cu. yd. *e* Barge lots alongside docks *f* Crushed granite. *g* F.o.b. Granite City, Ill. *h* F.o.b. plant. *i* Within three miles of Public Square. *j* 5% discount for cash. *k* Discount 35c. 500' to 2000; 70c. 2000 to 5000; 95c. over 5000. *l* Up to 200 cu. yd. *m* 50c. off for cash. *n* 25 c.y. or more. *o* 2% off for cash. *p* 10c. per ton off, cash 15 days.

CASH DISCOUNTS CEMENT to Contractors: truck delivery, 2% for cash on 10th of month; on carload deliveries, no trucking, same as dealer cash discount 10c. per bbl. for payment within 15 days of date of invoice, in Montreal 5% if payment before 15th.

CURRENT MAXIMUM PRICES RECEIVED AT CEMENT MILL

Charge for bags not included. For cloth bags, add 40c. per bbl.; 10c. refund allowed for each returnable bag; for paper bags add 15c. per bbl., not refundable.

	Bagged	Bulk		Bagged	Bulk		Bagged	Bulk
Buffington, Ind	$1.70	$1.65	Ironton, Ohio	$1.60	$1.55	Richard City, Tenn	$1.80	$1.75
Dallas, Tex. (Inc. 5c. tax)	1.80	1.75	Limedale, Ind	1.70	1.65	Steelton, Minn	1.80	1.75
Hannibal, Mo	1.70	1.65	Norfolk, Va	1.65	1.60	Universal, Pa	1.65	1.60
Hudson, N. Y	1.75	1.70	Northampton, Pa	1.55	1.50	Waco, Tex. (Plus 5c. Tax in Texas)	1.75	1.70
Independence, Kans	1.70	1.65	North Birmangham, Ala	1.70	1.65			

LOWER PENINSULA MICHIGAN. Uniform carload lot cement price established March 1937.

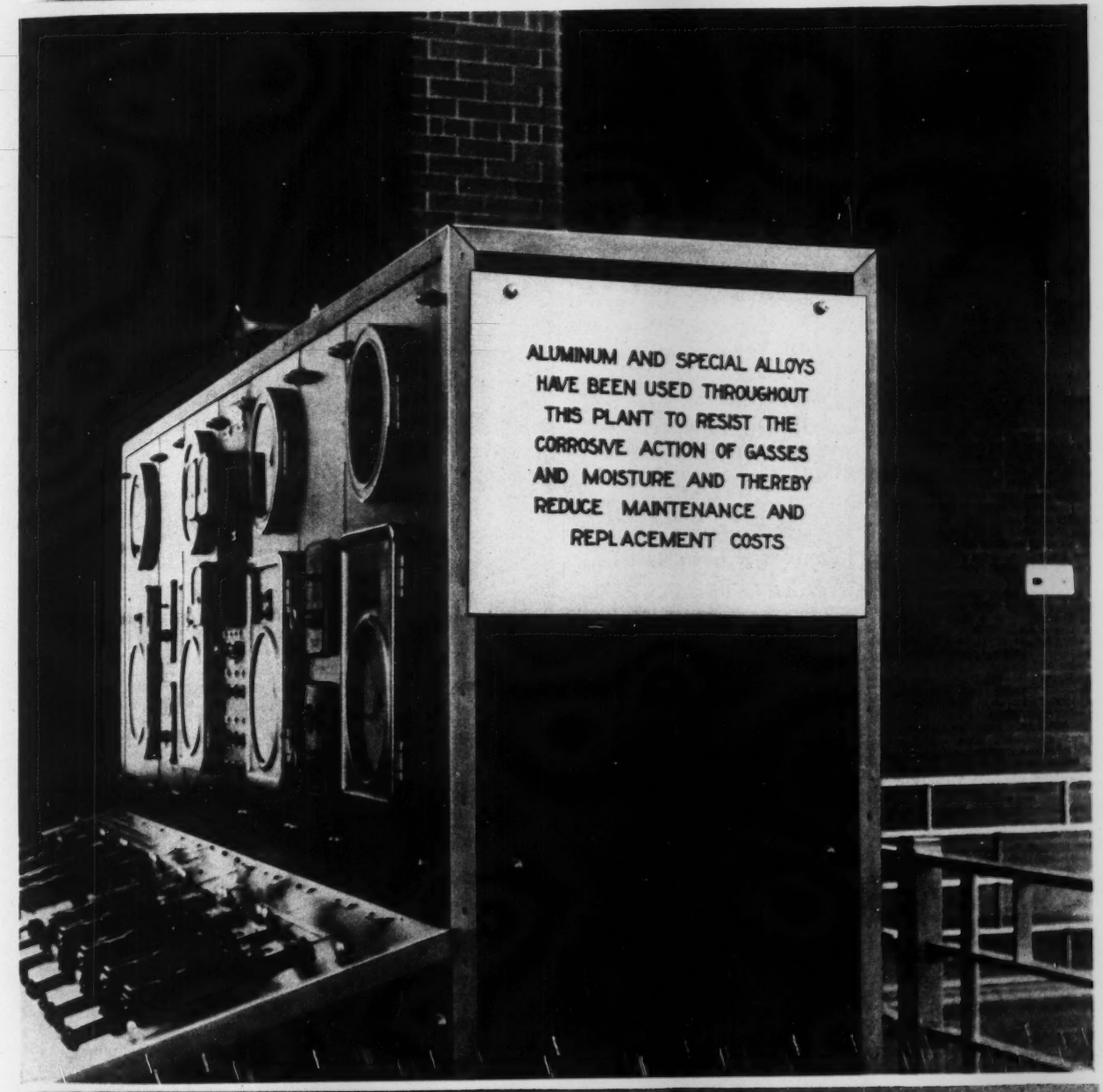
PAVING BRICK, BLOCKS, ASPHALT, ROAD OILS—F.O.B. CITY

	PAVING BRICKS AND BLOCKS			PAVING ASPHALT		ASPHALT BINDERS—FLUXES		CUTBACK ASPHALT		ROAD OILS	ASPHALT EMULSION (Quick-breaking)	
	Granite per M. lots of 50,000 4x4x8 in.	Brick per M. 3x4x8½ in. carload lots	Wood per sq. yd. 3½ in. 16-lb. treat	Per ton, less than 80 penetration		Per gal. 80-300 penetration		Per ton		Per gal.	Per gal.	
				Tank car	Drums	Tank car	Drums	Tank car	Drums	Tank car	Tank car	Drums
Atlanta	$75.00	$39.35	$2.25	$16.60*e*	$21.80*e*	$0.0675*e*	$0.0968*e*	$0.0734*he*	$0.1053*he*	$0.0584*e*	$0.0834	$0.0834
Baltimore	140.00	44.00‡	2.50	13.00	18.00	.06	.085	.07*h*	.10	.....	.....	.....
Birmingham	.....	25.00	.....	18.20	23.20	.0747	.1047	.0834*h*	.1134*h*	.....	.....	.....
Boston	75.00	45.00	3.00	13.00	19.00	.05	.08	.06*h*	.09*h*	.....	.09‡	.12‡
Chicago	140.00	52.00	2.60	14.00	18.00	13.00*g*	17.00*g*	.06*h*	.11*h*	.03	.08	.12
Cincinnati	112.00	37.50	.....	13.31	17.31	.09	.....	16.00	.....	.051	.078	.....
Cleveland	110.00	37.25	2.80	15.25	20.50	.07	.08	.07*h*	.085*h*	.05	.08	.09
Dallas	.....	30.50	.....	12.00	17.00	.04	.07	13.00	18.00	.035	.05/.07	.07/.09
Denver	.....	27.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Detroit	.....	35.00	.....	14.10*f*	20.00*f*	14.00*g*	18.40*g*	14.00	19.70	.0535	.066	.0995
Kansas City	.....	44.00	.....	18.50	23.50	.077	.1075	.077*h*	.107*h*	.057	.11	.15
Los Angeles	.....	50.00	.....	6.50*b*	15.00	6.50*b*	15.00*g*	5.50*b*	.....	.0192	.0525	.1125
Minneapolis	.....	.....	1.90*d*	19.20	24.20	.10	.12	19.30	28.80	.056	.....	.....
Montreal	82.50	.....	3.62	14.60	21.25	.105	.1375	.101*h*	.121*h*	.0935	.13	.16
New Orleans	.....	.....	.....	14.00*a*	19.00*a*	.055	.085	.06*h*	.09*h*	.....	.078	.....
New York	.....	68.00	2.90	13.50	18.50	.055	.08	.06*h*	.09*h*	.....	.0725	.1035
Philadelphia	120.00	42.50	2.84	14.00	19.00	.055	.08	.06*h*	.09*h*	.05	.06	.09
Pittsburgh	115.00	40.00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
St. Louis	110.00/121.00	37.00	.....	12.00	17.00	.05	.08	.055*h*	.085*h*	.035	.07	.10
San Francisco	.....	70.00	.....	6.50	15.00	6.50*g*	15.00*g*	7.00	17.50	.025	.0475	.117
Seattle	.....	60.00*c*	.....	13.90	22.90	.....	24.50*g*	9.50/10.50	23.00/24.00	7.75	.0575	.1308

‡ Delivered. *a* F.o.b. Baton Rouge. *b* Delivered to purchaser's warehouse. *c* 3½x4x8½ in. *d* 2½ in. 6 to 8-lb. treatment. *e* Local reduction due to 20% reduction intra-state class freight rates, only Georgia affected. *f* Mexican. *g* Per ton. *h* Per gallon.

(Continued on page 156)

They say this about Aluminum at Cleveland's Easterly Sewage Treatment Plant



ALCOA ALUMINUM

(Continued from page 154)

IRON AND STEEL PRODUCTS—BASE MILL PRICES

	STRUCT. SHAPES-PLATE	REINF. BARS ¼-in. billet *b*	RIVETS ½-in. structural	WIRE NAILS Base	SHEET PILING Base	STEEL RAILS Per Gross Ton: Standard	Light	Re-rolled	TRACK SUPPLIES: Angle Bars	Std. Spikes *c*	Tie Plates *c*	Track Bolts
Birmingham	$2.10	$2.05	$3.40	$2.45	....	$40.00	$40.00	$39.00	$2.70	$3.00	$2.15	$4.15
Chicago	2.10	2.05	3.40	2.45	$2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.15
Pittsburgh	2.10	2.05	3.40	2.45*d*	2.40	40.00	40.00	39.00	2.70	3.00	2.15	4.15
Buffalo	2.10	2.05	....	....	2.40	....	....	....	....	....	2.15	....
Cleveland	2.10	2.05	3.40	2.45	....	....	....	....	....	....	....	....
Youngstown	....	2.05	....	....	....	....	....	....	....	3.00	....	....
Detroit	....	2.15‡	....	....	....	....	....	....	....	....	....	....
Gulf ports	2.45*a*	2.40*a*	....	....	2.85*a*	....	....	....	....	....	....	....
Pacific ports	2.70*a*	2.50*a*	....	....	2.90*a*	....	....	....	....	3.00	2.25	....

‡ Delivered. *a* F.o.b. cars dock. *b* For rail steel deduct 15c. from billet prices. *c* Other basing points include Portsmouth, O., Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., and Pacific coast ports, on tie plates alone, Steelton, Pa., on spikes alone, Lebanon, Pa., Richmond, Va. *d* Add switching charge $18 per c.l.

IRON AND STEEL PRODUCTS—F.O.B. WAREHOUSE, PER 100 LB., BASE PRICE

	STRUCTURAL SHAPES Per 100 lb., base price	REINFORCING BARS Per 100 lb., 1 in., base price: 15 tons or over *b* New billet	Rail steel	Add $/cwt. for Switch	Del.	EXPANDED METAL LATH Per 100 sq.yd., carload lots: Std. diamond mesh, 3.4 lb.	Std. ribbed 3.4 lb.	WELDED FABRIC REINFORCING Per 100 s.f., carload lots: 4x16 in., No. 5 & 10 wires	4x12 in., No. 8 & 12 wires	6x6 in. No. 6 & 6 wires Per sq. yd.	SHEET PILING Per 100 lb. base price
Atlanta	$2.74	$2.29	$2.14	.02½	.10	$21.00	$23.00	$1.66	$1.25	$0.1566	$3.04
Baltimore	3.55	2.70	2.55	.....	.10	21.00	23.00	1.54	1.17	.1458	2.70
Birmingham	2.10*a*	2.05	1.90	.02½	.10	19.50	21.50	1.64	1.23	.1548	....
Boston	3.85	2.58	2.43	$20 C.L.	.10	21.00‡	23.00‡	1.60	1.21	.1512	2.99
Chicago	2.10*a*	2.05	1.90	.03	.05	18.50	20.50	1.51	1.15	.1422	2.40
Cincinnati	3.88	2.31*c*	2.16*c*	.....	.05	20.50	22.50	1.50	1.14	.1413	....
Cleveland	3.43*g*	2.05	1.90	.02½	.10	20.50	22.50	1.50	1.14	.1422	....
Dallas	4.15	2.80	2.65	.....	.....	25.00	27.00	1.77	1.32	.1674	....
Denver	4.21	3.89	3.74	.....	.....	23.50	25.50	1.81	1.34	.1710	....
Detroit	3.80‡	2.55	2.40	.....	.10	22.50	24.50	1.52	1.16	.1440	2.875
Kansas City	4.10	2.51*c*	2.36*c*	.0	.05	18.50	20.50	1.62	1.22	.1539	2.86
Los Angeles	3.50*f*	2.65	2.50	.02½	.05	23.00	27.50	1.77	1.32	.1674	3.50
Minneapolis	3.80‡	2.38*c*	2.23*c*	.0	.10	21.50	24.50	1.64	1.23	.1548	2.73*d*
Montreal	3.25	2.65	2.55	.....	.....	26.68	29.90	2.99	2.08	.314	3.95
New Orleans	3.90	2.69	2.54	.05	.10	21.00	23.00	1.67	1.26	.1584	2.875
New York	3.75	2.29	2.14	.....	.10	20.50	22.50	1.56	1.19	.1476	2.76
Philadelphia	3.40	2.37	2.22	.....	.....	20.50	22.50	1.55	1.18	.1467	2.72
Pittsburgh	2.10*a*	2.05	1.90	.02½	.10	21.50	24.50	1.43	1.10	.1350	2.40
St. Louis	3.82	2.29	2.14	.0	.05	23.50	25.50	1.53	1.16	.1449	2.70
San Francisco	3.90	2.50	2.35	.02½	.10	23.50	25.50	1.77	1.32	.1674	3.00
Seattle	2.70*e*	2.65*e*	.....	.....	.....	25.50	27.50	1.77	1.32	.1674	2.90*e*

‡ Delivered. *a* Mill prices. *b* 5–15 tons, add 15c. 1–5 tons, add 25c. Less than 1 ton, add 50c. *c* 20 tons or over Base. *d* Mill price plus freight. *e* F.o.b. dock. *f* Includes delivery in free delivery zone. *g* Less than 1 ton, add 30c.; 1 to 5 tons, add 10c.

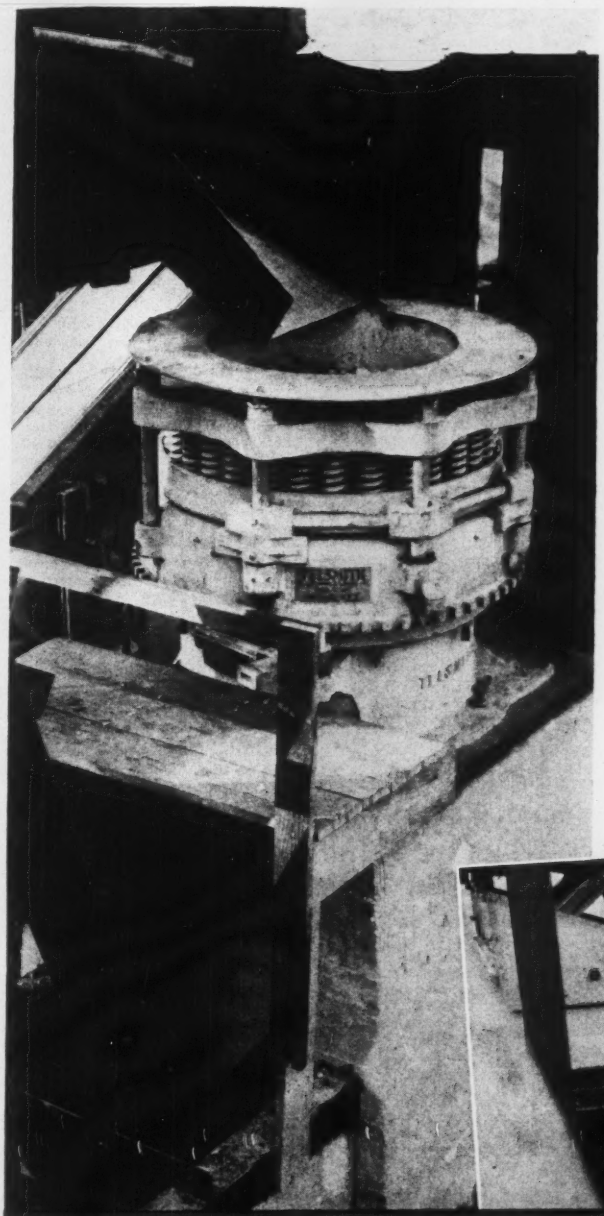
PLUMBING, HEATING, WATER, SEWER AND DRAIN PIPE

	C. I. PIPE Per net ton f.o.b. 6 in. to 24 in.*a*	VITRIFIED SEWER PIPE Per foot, 8 in., s.s.	delivered 12 in., s.s.	ASTM 24 in., d.s.	C13–35 36 in., d.s.	CLAY DRAIN TILE Per 1,000 ft., carload lots, 6 in.	f.o.b. 8 in.	CONCRETE SEWER PIPE Per ft., delivered: ASTM 12 in.	C 14–35 24 in.	WROUGHT STEEL PIPE Full standard weight, *h*: 1 to 3 in., Black %	Butt Weld 3½ to 6 in., Galv. %	Lap Weld Black %	Galv. %
Atlanta	$46.40	$0.26*bc*	$0.468*bc*	$1.69	$4.50*c*	$85.00	$128.00	$0.45	$1.625	62.2	54.2	59.7	51.2
Baltimore	49.80	.30	.55	2.40	6.25	110.00	170.00	.50	1.75	65.5	57.5	63.0	54.5
Birmingham	42.00	.25	.45	1.625	4.66	85.00	220.00	.40	1.60	62.2	54.2	59.7	51.2
Boston	52.00	.28	.54	2.475	6.67	136.00‡	196.50‡	.50	2.50	64.1	56.1	61.6	53.1
Chicago	50.80	.28	.54	2.25	6.25	100.00‡	150.00‡	.38	1.48	67.0	59.0	63.5	55.0
Cincinnati	49.70	.203	.3915	1.665	5.0225	75.00	120.00	.60	1.90	65.9	57.9	63.4	54.9
Cleveland	51.24	.175	.3375	1.35	4.2025	69.00	108.00	.34	1.45	67.8	59.8	65.3	56.8
Dallas	55.20	.27	.486	1.944	4.70	80.00	100.00	.46	1.57	59.9	51.9	57.3	48.3
Denver	57.60	.29†	.50†	2.10†	.....	130.00	220.00	.....	.....	58.4	50.4	55.7	47.2
Detroit	51.24	.147	.2835	1.215	4.70	66.45	111.40	.25	1.125	66.3	58.3	63.8	55.3
Kansas City	52.12	.30	.54	2.16	5.00	120.00	240.00	.45	1.60	62.9	54.9	60.0	51.5
Los Angeles	52.00	.282†	.508†	2.034†	5.085†	115.50	192.50	1.00	2.00	56.8	47.8	54.3	44.8
Minneapolis	54.20	.24†	.432†	1.728†	4.60†	.....	.....	.70	1.80	64.2	56.2	60.7	52.2
Montreal	60.00	.59	.90	3.15	5.10*e*	135.00‡	260.00‡	.48	1.92	.....	.....	.....	.....
New Orleans	48.38	.26	.48	1.69	.....	150.00	220.00	.37	2.10	62.4	54.4	58.8	50.3
New York	49.20	.32	.63	2.35	6.15	.....	.....	.64	1.70	64.9	56.8	62.4	53.9
Philadelphia	47.90	.21	.405	1.75	5.05	100.00	160.00	.54	1.80	65.3	57.3	62.8	54.3
Pittsburgh	52.60	.182†	.351†	1.44†	4.20	97.80	154.20	.85*g*	2.00*g*	68.5*i*	60.5*i*	66.0*i*	57.5*i*
St. Louis	49.48	.265	.468	2.016	3.96	85.00	170.00	.80	2.00	65.1	57.1	62.0	53.5
San Francisco	52.00	.3275*d*	.5895*d*	2.358	5.895	107.25	178.75	.45	2.50	.....	.....	.....	.....
Seattle	52.35	.35	.63	2.52	6.30	72.00	175.00	.60*f*	1.60*f*	.....	.....	.....	.....

‡ Delivered. † F.o.b. *a* B. & S. class B and heavier, C/L lots, 200 tons and over Burlington, N. J. (base) $46.00. Gas pipe and class A, $3 per ton additional, 4 in., $3 per ton additional, 30 in. and larger usually $2 per ton less. *b* Double strength. *c* List to dealer. *d* List. *e* 30-inch. *f* Less 5% for cash. *g* Culvert pipe. *h* Discounts from standard list consumers carload prices, except Pittsburgh prices are f.o.b. mill. Base price $200 per net ton. List prices per ft.: ½ in., 8½c.; ¾ in., 11½c.; 1 in., 17c.; 2 in., 37c.; 2½ in., 58½c.; 3 in., 76½c.; 4 in., $1.09; 6 in., $1.92. *i* Applies also at Lorain, Ohio, mills. Chicago delivered base is 2½ points less Freight is figured from Pittsburgh, Lorain, O., Chicago Dist. Billing is from point producing lowest price at destination. WROUGHT IRON PIPE: Base price and list prices per ft. same as wrought steel pipe. Discount for Pittsburgh base: Butt-weld — 1 in. and 1¼ in. black 34, galv. 19; 1½ in. black 38, galv. 21½; 2 in. black 37½, galv. 21. Lapweld — 2½ in. to 3½ in. black 31½, galv. 17½ in.; 4½ in. to 8 in. black, 32½ galv. 20.

(Continued on page 158)

TELSMITH
is PROFIT EQUIPMENT
FOR THE MUSKOGEE GRAVEL COMPANY



● In a gravel plant, performance depends on equipment . . . profits depend on costs. The Muskogee Gravel Co., Muskogee, Oklahoma, has operated its Telsmith plant for over a year. "It has always performed satisfactorily in every way," says Manager A. O. Walker. "Maintenance has been at a minimum, and we are very well pleased with the operation and production costs.

"We are especially well pleased with the improved type Gyrasphere Crusher . . . it is showing very little wear or depreciation." This, in spite of a very wet feed—the supreme test of effective sealing and lubrication! For intermediate and fine crushing, it crushes faster, with less power, turning out larger tonnage and a finer product. Like a mortar and pestle . . . only inverted for easy discharge . . . the spherical head and its corresponding concave catch and break chunks of rock between two multi-curved surfaces—a perfect *cubing* action. *Write for free Bulletin Y-2.*

In this plant, a Telsmith Pulsator screens sand, gravel and crushed rock, wet or dry, and does it *right.* Its circular movement produces a maximum screening action that's *uniform* on every inch of the wire regardless of load. The toughest alloy steels, anti-friction bearings and special seal protection for working parts give it longer life and lower up-keep. *Get the details in free Bulletin V-2.*

Telsmith complete pit or quarry plant service is described in *free Bulletin E-2.*

MC-11-39

SMITH ENGINEERING WORKS, 500 E. CAPITOL DRIVE, MILWAUKEE, WIS.

Associates in Canada: Canadian Vickers, Limited, Montreal and Vancouver. Cable Addresses: Smitheng, Milwaukee — Canada, London.

50 Church Street, New York City — 111 W. Washington Blvd., Chicago, Ill. — 719 Commercial Trust Bldg., Philadelphia, Pa. — 51 Binney Street, Cambridge, Mass. — 412 Westinghouse Bldg., Pittsburgh, Pa. — Brandeis M. & S. Co., Louisville, Ky.

(Continued from page 156)

LUMBER, TIMBER, PLYWOOD—PER M FT. B.M., CARLOAD LOTS F.O.B.

	SHORT LEAF YELLOW PINE AND DOUGLAS FIR — All S. L. Y. P. is No. 2 common or better and for No. 1 N. C. Box. (Prices in Bold Face) *All Fir planks No. 2 common; Fir timber is No. 1 common. Lengths up to 20 ft. (Prices in italics)*									LONG LEAF Y. P. Merchantable grade up to 20 ft.		PLYWOOD Rail freight increment (See note for base price)	
	1x6, S4S	1x8, S4S	2x4, S4S	2x6, S4S	2x8, S4S	2x10, S4S	3x12, Rgh	6x12, Rgh	12x12, Rgh	2x12, Rgh	12x12, Rgh	5/16"	3/4"
Atlanta	**$18.50**	**$18.50**	**$18.50**	**$19.00**	**$19.00**	**$19.00**	**$26.00**	.....	.....	$38.50	$50.50	$17.75	$21.60
Baltimore	**24.00**	**25.00**	**24.00**	**25.00**	**26.00**	**27.00**	**39.00**	.....	.....	66.00	70.00	17.35*g*	21.15*g*
	31.00	*31.00*	*31.00*	*31.00*	*31.00*	*31.00*	*39.00*	***$39.00***	***$39.00***	.....	.....	.....	.....
Birmingham	**19.00**	**19.00**	**19.00**	**19.00**	**19.00**	**20.00**	**30.00**	**30.00**	**30.00**	.....	.....	16.25	19.85
[1]	22.00	22.00	26.00	26.00	26.00	36.00	54.00	.....	.....	48.00	53.00	.....	.....
Boston	28.00[2]	28.00[2]	32.00[2]	32.00	48.00[1]	60.00[1]	72.00[1]	.....	.....	72.00	72.00	17.35*g*	21.15*g*
	28.00	*28.00*	*30.00*	*30.00*	*32.00*	*32.00*	*35.00*	*40.00*	*40.00*	.....	.....	.....	.....
Chicago	**29.00**	**30.00**	**32.00**	**31.00**	**32.00**	**31.00**	**47.00**	.....	.....	75.00	85.00	13.15	16.05
	33.00	*34.00*	*37.00*	*36.00*	*37.00*	*37.00*	*41.00*	*40.00*	*40.00*	.....	.....	.....	.....
Cincinnati	**23.75**	**23.75**	**25.00**	**23.25**	**24.25**	**26.50**	**37.50**	.....	.....	46.00	49.00	16.25	19.85
	.....	.....	.....	.....	.....	.....	*39.50*	*39.50*	*39.50*	.....	.....	.....	.....
Cleveland *f*	**30.00**	**31.00**	**36.00**	**31.00**	**32.00**	**40.00**	**48.00**	.....	.....	52.00	62.00[8]	16.65	20.25
Dallas *e*	**28.50**	**31.50**	**30.00**	**26.00**	**28.50**	**31.50**	**55.00**	**54.00**	**54.00**	64.50	71.00	13.90	16.95
Denver ‡	41.00[4]	39.00[4]	43.00[4]	42.00[4]	42.00[4]	47.00[4]	45.00[4]	56.00[4]	64.50[4]	.....	.....	9.90	12.05
Detroit	**24.00**	**24.00**	**25.00**	**25.00**	**26.00**	**26.00**	**34.00**	.....	.....	33.00	43.00	16.25	19.85
	.....	.....	.....	*36.00*	*36.00*	*35.00*	*37.00*	*40.00*	*40.00*	.....	.....	.....	.....
Kansas City	**27.00**	**28.50**	**28.00**	**26.00**	**28.00**	**30.00**	**35.00**	.....	.....	55.00	58.00	12.25	14.95
	28.00	*28.00*	*28.00*	*28.00*	*28.00*	*29.00*	*34.00*	*35.00*	*35.00*	.....	.....	.....	.....
Los Angeles *a*	*35.00*	*35.00*	*35.00*	*35.00*	*36.00*	*36.00*	*42.00*	*46.00*	***42.00***	.....	.....	9.35*gh*	11.35*gh*
Minneapolis ‡*b*	43.00[5]	43.00[5]	.....	.....	.....	.....	.....	.....	.....	.....	.....	12.05	14.70
‡	*34.00*	*34.00*	*35.00*	*35.00*	*35.00*	*35.00*	*55.00*	*55.00*	*55.00*	.....	.....	.....	.....
Montreal [7]	*45.00*	*45.00*	*49.00*	*47.00*	48.00	58.00	**84.00**	.....	.....	135.00	145.00	.....	.....
	40.00	*40.00*	*40.00*	*40.00*	*40.00*	*41.50*	*42.00*	***41.00***	***40.00***	.....	.....	.....	.....
New Orleans	**22.00**	**22.00**	**20.00**	**19.00**	**20.00**	**22.00**	**42.00**	.....	.....	58.00	65.00	13.90	16.95
	26.00	*26.00*	*28.00*	*29.00*	*32.00*	*30.00*	*32.00*	.....	.....	.....	.....	.....	.....
New York ‡	**36.00**	**37.00**	**35.00**	**36.00**	**36.00**	**37.00**	**42.00**	.....	.....	77.50	80.00	17.35*g*	21.15*g*
‡	.....	.....	*40.00*	*40.00*	*40.00*	*40.00*	*40.00*	***42.50***	***42.50***	.....	.....	.....	.....
Philadelphia	**23.50**	**24.00**	**25.00**	**25.00**	**26.00**	**26.50**	**28.50**	.....	.....	54.00	56.00	17.35*g*	21.15*g*
	34.00	*35.00*	*38.00*	*37.25*	*36.50*	*36.50*	*41.75*	***31.50***	***31.50***	.....	.....	.....	.....
Pittsburgh	**38.10**	**39.90**	**47.05**	**42.00**	**45.65**	**46.90**	**59.70**	.....	.....	.....	.....	17.00	20.70
	51.90	*49.60*	*49.60*	*49.00*	*48.90*	*49.25*	*66.55*	*66.55*	*66.55*	.....	.....	.....	.....
St. Louis ‡*c*	**31.00**	**32.50**	**31.00**	**29.50**	**30.50**	**32.00**	**48.00**	*51.00*	*51.00*	**74.00**	**73.00**	13.90	16.95
San Francisco *d*	*19.00*	*19.00*	*19.00*	*19.00*	*19.00*	*19.00*	*23.00*	*23.00*	*23.00*	.....	.....	7.30*g*	8.90*g*
Seattle	*20.00*	*20.00*	*20.00*	*20.00*	*20.00*	*20.00*	*26.00*	*26.00*	*26.00*	.....	.....	0.00	0.00

Bold Face type, Southern Pine. *Italics, Douglas Fir.* [1] Long leaf. [2] Roofers' N. C. Pine. [3] Spruce. [4] Native. [5] Western Pine, No. 3 Common. [7] Pine. [8] Norway Pine. ‡ Delivered. *a* Yard prices. *b* Contractors discount in Minneapolis and St. Paul discontinued May 21, 1938. *c* 5M ft. or less. *d* At ship's tackle. *e* 10% discount taken off.

Note: Special concrete form grade Fir Plywood, 4' by 8' panels, 5-ply, sanded 2 sides, water resistant glue, car load lots, delivered per 1000 sq. ft. surface. Base price — Seattle: 1/2", $73.00 net. 3/4", $81.00 net. For other centers add rail freight increment from table for proper size. Form oil treatment, and mineral paint sealed edge, charges included. For resin dipped treatment, $10.00 per M. *g* Lower rate by water shipment. *h* 50,000 lb. minimum.

GLASS, EXPLOSIVES, CHEMICALS

	WINDOW GLASS — Discounts from latest jobbers list, Sept. 15, 1928 Single or Double Thickness		EXPLOSIVES — Per lb. 40% Ammonia Gelatin in 50-lb. cases delivered in 200 lb. lots*
	A quality	B quality	
Atlanta	88%	88%	$0.16
Baltimore	88%	87%	.16
Birmingham	89%	90%	.115
Boston	87%	89%	.16
Chicago	79%*c*	79%*c*	.16
Cincinnati	89–10%	91–10%	.16
Cleveland	85–10%	85–10%	.20
Dallas	80%	80%	.175
Denver	76%*d*	76%*d*	.16*e*
Detroit	87–10%	89–10%	.16
Kansas City	78–10%	79–10%	.165
Los Angeles	90%*a*	90 *a* 40%	.1675
Minneapolis	76%*d*	76%*d*	.165
Montreal	70–10%*b*		.18†
New Orleans	86%	88%	.17
New York	89%	90%	.23
Philadelphia	89–10%	90–10%	.16
Pittsburgh	86%	87%	.1525
St. Louis	86–10%	87–10%	.165
San Francisco	78%	83%	.165
Seattle	86%	90%	.1675

Price of 60% Ammonia Gelatin is $0.015 per lb. higher than 40%

a Disc. from list Aug. 1, 1929. *b* Also less 6% tax exemption. *c* Discounts from jobbers list, Nov. 16, 1938. *d* Discount from jobbers' list Aug. 15, 1938.

* Urban prices influenced by service charges or local storage and delivery regulations, do not consistently reflect quantity prices in less congested areas. *e* F.o.b. Louviers, Colo. *f* In boroughs of Kings, Queens and Richmond, and in Manhattan south of Canal Street, add delivery charge of $6.00 per trip. † F.o.b.

40% Ammonia Gelatin price ranges in other than urban areas, per lb. (except Seismograph Grades)

	C/L 20,000 lb. net	Tons	200 lb. lots
E. of the Miss., except Fla.	$0.115	$0.14	$0.16
W. of Miss., to Rocky Mtn. States, and Fla	.12 –.13	.145 –.16	.165 –.18
Rocky Mtn. States	.12 –.1425	.14 –.155**	.16 –.175**
Pacific N. W. States	.1175–.13	.1475–.16	.1675–.18
Pacific S. W. States	.1150–.1275	.145 –.1525	.165 –.1725

** F.o.b. Louviers, Colo., or Butte, Mont.

PILES, TIES—F.O.B.

PILES

Prices per linear foot, pine, with bark on, f.o.b. New York; delivered from barge 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Short Leaf — Barge	Short Leaf — Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.18	$0.195
12 in.— 2 ft. from butt	6 in.	50 to 59 ft.	.225	.24
12 in.— 2 ft. from butt	6 in.	60 to 69 ft.	.23	.255
14 in.— 2 ft. from butt	6 in.	50 to 69 ft.	.24	.265
14 in.— 2 ft. from butt	6 in.	70 to 79 ft.	.28	.275
14 in.— 2 ft. from butt	5 in.	80 to 85 ft.	.40	.415
14 in.—2 ft. from butt	5 in.	85 to 89 ft.	.42	.482

RAILWAY TIES

Prices f.o.b., per tie for carload lots:		6" x 8" x 8' Untr.	6" x 8" x 8' Tr.	7" x 9" x 8'6" Untr.	7" x 9" x 8'6" Tr.
Boston	Oak	$1.10	....	$1.60	....
	Pine	1.25	$1.90*a*	$.85	$2.75*a*
New York	S. L. Sap Pine	1.05/1.15	1.90*g*	....	2.35*g*
	Mixed Oak	1.50	1.35	1.85	....
Birmingham	White Oak	.85	1.50*a*	1.35	1.70*a*
	Southern Pine	.55*b*	1.10*ab*	.70	1.30*a*
Chicago	Oak	....	1.65*a*	....	2.25*a*
	Southern Pine	....	1.53*a*	....	2.13*a*
Los Angeles	Douglas Fir	.64	1.38*a*	.90	1.80*a*
Philadelphia	Red Oak	1.10	....	....	2.40*a*
St. Louis	White Oak	.90	....	1.25	....
	Red Oak	.90	1.40*a*	1.25	1.85*a*
	Sap Pine or Cypress	.80	....	1.15	....
San Francisco	Douglas Fir	.80*bef*	....	....	1.85*caf*
Montreal	Birch or Maple	.65	1.05*a*	.75	1.35*a*

Tr.— Treated; Untr.— Untreated. *a* Creosoted. *b* 6" x 8" x 8'6". *c* Empty cell. *d* Zinc. *e* Green. *f* At ships tackle. *g* Dense pine.

CHEMICALS

Water, sewage treatment, road work, f.o.b. carlots, New York

Bleaching powder, in drums, f.o.b. works, per 100-lb.	$2.00–2.85
Chlorine cylinders, per lb. delivered	.055
Calcium chloride, 77–80%, flaked, in 400-lb. drums or 100-lb. moisture proof bags, f.o.b. works, freight equalized with points of competition, per ton	22.00–35.00
Silicate of soda, 52 deg., in drums, f.o.b. works, per 100 lb.	1.40
Soda ash, 58%, in paper bags, per 100 lb. dense	1.10
Sulphate of aluminum, commercial, in 100-lb. bags, per ton	23.00
Sulphate of copper, in bbl., per 100-lb.	4.05

(Continued on page 160)

STRENGTH · ELASTICITY · FLEXIBILITY · TOUGHNESS · DURABILITY

THE ACCIDENTAL FALLING . . . of an apple in an orchard started the chain of thought which led Sir Isaac Newton to propound his Law of Universal Gravity.

The Law of Leschen QUALITY

"HERCULES" • RED-STRAND • WIRE ROPE (REG. U.S. PAT. OFF.)

There is nothing accidental, however, about Leschen Quality, for ever since Leschen Wire Rope has been made, there have been definite principles governing its manufacture—all based on the Leschen Law of "Quality First".

As a result, you can be sure that "HERCULES" (Red-Strand) Wire Rope—true to its inheritance—will measure up to the highest standards of performance and meet the actual demands of the toughest jobs. It is founded on determination and experience, and it is designed and made to give you long, safe and economical service. Nothing is left to chance.

You will get more out of "HERCULES" (Red-Strand) Wire Rope because the Leschen Law of Quality demands that we put the utmost into it.

Highlights of Leschen Quality

1
Acid Open-Hearth Steel Wire

2
Rigid tests and inspections

3
Correct manufacturing methods

4
High standards for all grades

5
Furnished in both Round and Flattened Strand constructions—in either Standard or Preformed type.

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

WIRE ROPE MAKERS • ESTABLISHED 1857

5909 KENNERLY AVENUE • • ST. LOUIS, MO.

New York.....90 West Street
Chicago.....810 W. Washington Blvd.
Denver.....1554 Wazee Street
San Francisco.....520 Fourth Street
Portland.....914 N. W. 14th Avenue
Seattle.....3410 First Avenue South

(Continued from page 158)

STRUCTURAL CLAY BUILDING TILE, BRICK AND LIME—DELIVERED

	STRUCTURAL CLAY TILE — PARTITION — SCORED Per M. lots of 2,000 pieces or over,			STRUCTURAL CLAY TILE — LOAD BEARING — SCORED Per M. lots of 2,000 pieces or over,			BRICK Per M. in quantity.		LIME Per ton,		
	3x12x12 in.	4x12x12 in.	8x12x12 in.	8x12x12 in.	10x12x12 in.	12x12x12 in.	Common backing	Straight hard	Hydrated finishing	In paper Common hydrated	Carload lot Pulverized or lump
Atlanta	$100.00	$120.00	$200.00	$230.00	$240.00	$250.00	$11.50	$16.00	$24.00	$15.50	$15.50
Baltimore	74.00	80.00	165.00	195.00	250.00	300.00	13.00*k*	16.00*k*	14.00	15.00	22.00
Birmingham	78.75	84.00	157.50	189.00	201.25	242.00	15.00	19.00	3.00*o*	1.75*o*	2.25*lo*
Boston	90.75*ab*	96.80*ab*	181.50*ab*	205.70*ab*	266.70*ab*	304.80*a*	17.00*i*	20.00*i*	19.00	13.00	3.10*lp*
Chicago	68.10	72.60	135.90	185.70	234.90	268.10	11.00	12.00	15.00	14.40	12.20
Cincinnati	56.45	60.40	115.25	138.70	166.50	206.40	16.00	16.00	15.90	13.00	.....
Cleveland	52.50	56.00	105.00	126.00	170.00	194.50	15.50	15.50	15.20*j*	12.80*j*	2.65*jm*
Dallas	62.50	67.00	135.00	162.00	177.00	263.00	11.50*i*	13.50*i*	19.00	15.00	.95*n*
Denver	78.50	88.00	141.50	166.50	196.00	225.50	12.00	15.50	28.00*j*	17.00*j*	35.00*j*
Detroit	68.90	73.50	137.80	175.50	232.00	265.00*e*	16.00	17.00	13.50	11.25	12.75
Kansas City	64.50	66.50	86.00*e*	125.50	159.75	186.25	14.00	24.00	19.10	12.80	10.70
Los Angeles	73.50†*r*	89.50†*r*	128.00†*r*	210.00†*r*	368.00†*r*	460.00†*r*	12.00	14.00	16.50	.....	17.50
Minneapolis	80.35	85.70	146.00	192.85	176.20*d*	245.20*d*	13.10	15.10*g*	21.00	16.00	19.00
Montreal	64.00*a*	77.00*a*	141.00*a*	77.00*a*	128.00*a*	.....	21.00	31.00	24.60	16.00	1.75*lo*
New Orleans	72.00	72.00	135.00	162.00	210.00	260.00	14.00	.....	18.30	12.08	14.10
New York	87.00	93.00	128.00	193.30*h*	238.80*h*	295.60*h*	13.00	.....	20.00	15.00	18.00
Philadelphia	77.40	82.50	154.70	185.70	229.90	284.60	11.00*s*	18.00*s*	15.50*q*	10.05	10.55
Pittsburgh	58.40	62.40	116.85	124.00	153.00	193.75	17.00	25.00	17.70	15.20	2.57*m*
St. Louis	62.00	65.00	120.00	180.00	234.00	280.00	16.00	17.00	22.00	16.00	2.30*lm*
San Francisco	84.00	94.50	225.00	.....	.....	.....	14.00	17.00	.55*o*	.40*o*	2.05*m*
Seattle	100.00	110.00	220.00	.....	.....	.....	17.50*f*	17.50*f*	20.00*s*	20.00*s*	20.00*s*

† F.o.b. *a* Smooth. *b* Carload lots delivered to job. *c* 6 x 12 x 12 in. *d* Not load bearing. *e* 48 lb. tile. *f* Less $1.00, ½ cash 15 days, balance 30 days. *g* Selected common. *h* F.o.b. Perth Amboy, N. J. *i* 50c per M. off for cash. *j* LCL. *k* $1.00 discount if paid in 10 days. *l* Lump. *m* Per bbl., 180 lb. *n* Per sack 100 lb. *o* Per bbl., 200 lb. *p* 280 lb. bag. *q* 15-ton cars. *r* 5% discount 10 days. *s* 2% off cash. *t* 5½ x 8 x 12.

PAINT, ROOFING—F.O.B. CARLOAD LOTS

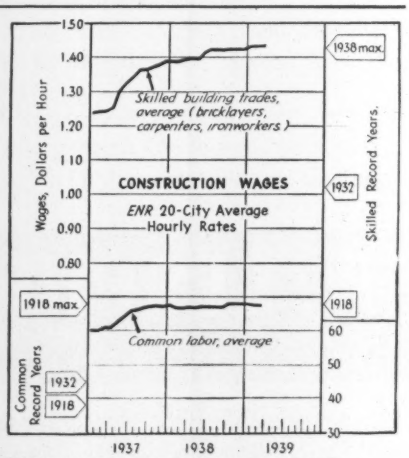
	RED LEAD Per 100 lb. in 600-lb. (Approx.) bbl. Dry	WHITE LEAD Per 100 lb. in oil	READY-MIXED PAINT Per gal., drums Graphite *b*	Aluminum *c*	Ferric Oxide *d*	ROOFING SUPPLIES Carload lots f.o.b. factory Rolls, slate surfaced, 85–90 lb., per sq.	Asphalt felt, per 100 lb.	Tar felt, per 100 lb.	Asphalt coating per gal.	Tar pitch 350 lb. bbl. per ton
Atlanta	$8.50	$12.625	$1.30	$2.25	$1.20	$1.71	$1.65	$1.65	$.36	$26.00
Baltimore	8.25	12.25	1.45	2.25	1.70	2.16	2.75	2.75	.40	27.50
Birmingham	8.50	12.625	2.35	2.35	1.85	2.07	2.03	2.03	.45	30.37
Boston	8.25	12.25	1.80‡	2.20‡	1.80‡	1.75‡	1.90*h*‡	1.90*h*‡	.40‡	20.00‡
Chicago	8.25	12.25	1.88	2.53	1.56	1.58*hf*	1.49*hf*	1.49*hf*	.26*f*	21.00*f*
Cincinnati	8.25	12.25	1.45	2.50	1.40	2.40	2.39*h*	2.39*h*	.36	21.00
Cleveland	8.25	12.25	1.90	2.60	1.40	1.45	1.50*h*	1.50*h*	.36	21.00
Dallas	8.25	13.00	1.80	1.95	....	2.75*h*	2.50*h*	2.50*h*	.60	....
Denver	8.75	12.75	....	....	....	2.45	4.00	3.00	.35	28.00
Detroit	8.25	12.25	2.00	3.00	1.75	2.40	3.25	3.25	.35	29.00
Kansas City	8.25	12.375	2.15*g*	2.40*g*	1.67*g*	1.93	2.09	2.09	.25	25.00
Los Angeles	8.50	12.75	1.60	2.25	2.30	2.10	1.50	....	.45	....
Minneapolis	8.25	12.375	....	....	....	1.45*i*	1.50*hi*	1.50*hi*	.29	21.00
Montreal	9.75	9.00	2.25	2.80	2.35	3.05	1.85	2.15	.95	10.80*k*
New York	8.25	12.25	1.80	2.45	1.48	1.45	1.50*h*	1.50*h*	.23	24.00
Philadelphia	8.25	12.25	....	....	....	1.92*e*	1.99*he*	1.99*he*	.41*e*	21.00
Pittsburgh	8.25	12.25	1.05	1.95	.80	1.95	1.94*h*	1.94*h*	.34	26.00
St. Louis	8.25	12.25	1.70/1.90	2.50/2.75	1.50/1.90	1.45	1.50	1.50	.22	21.00
San Francisco	8.50	12.50	1.80	2.75	1.10/2.00	1.66	1.90	1.90	.325	20.50
Seattle	8.50	12.75	1.80	3.00	2.20	2.02	1.43/2.10	2.60	.54	24.10*j*

‡ Delivered. Note: Red lead in oil 50c. higher than white lead in oil. *a* Red lead prices change frequently due to pig lead price changes. *b* U. S. War Dept. Spec. 3–49A. *c* ASTM Spec. D266–31. *d* 80% maximum ferric oxide. *e* Subject to 25% discount. *f* Distributors' price to contractors. *g* 5 gal. can. *h* Per roll, 65 lb. *i* Minneapolis and vicinity. *j* Asphalt pitch. *k* 550 lb. barrel.

SKILLED AND COMMON WAGE RATES—PER HOUR

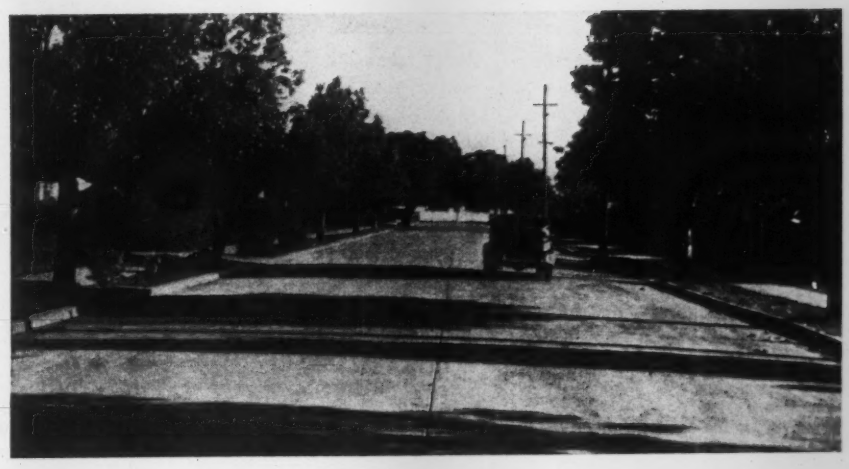
	Bricklayers	Carpenters	Struct. Iron Workers	Hoisting Engineers	Plasterers	Common Labor Building	Common Labor Heavy Const.
Atlanta	$1.25	$1.00	$1.25	$1.00/1.25	$1.25	$0.40/.50	$0.40/.50
Baltimore	1.50	1.25	1.50	1.50	1.25	.50	.50
Birmingham	1.50	1.125	1.25	1.125	1.00	.30/.40*a*	.30/.40*a*
Boston	1.50	1.375	1.80	1.375	1.625	.60/.85	.60/.85
Chicago	1.70	1.625	1.70	1.625	1.70	1.025	1.025
Cincinnati	1.00/1.625	.70/1.45	1.525	1.00/1.525	1.00/1.625	.60/.75	.60/.75
Cleveland	1.625	1.375	1.50	1.50	1.50	.90	.90
Dallas	1.50	1.25	1.25	1.00	1.50	.40	.40
Denver	1.50*b*	1.50*b*	1.43*b*	....	1.43*b*	.718*b*	.718*b*
Detroit	1.50	1.25	1.50	1.50	1.55	.60/.80	.60/.80
Kansas City	1.625	1.375	1.50	1.50	1.575	.85	.45/.50
Los Angeles	1.25	1.10	1.375	1.375	1.50	.625	.625
Minneapolis	1.375	1.25*d*	1.50	1.40	1.50*e*	.85	.35
New Orleans	1.00	1.00	1.25	1.00	1.00	.40	.40
New York	1.886*b*	1.75*b*	1.925	2.00*b*	2.00*c*	1.031	.875/.95
Philadelphia	1.65	1.25	1.50	1.50	1.565	.60	.60
Pittsburgh	1.75	1.50	1.50	1.25	1.75	.80	.70
St. Louis	1.50	1.25	1.75	1.57/2.00	1.58	.45/.875	.45/.875
San Francisco	1.75*c*	1.25*f*	1.50	1.50	1.60*c*	.81	.65
Seattle	1.60*c*	1.25*c*	1.50*c*	1.50*c*	1.60*c*	.90*c*	.90*c*
Montreal	.70	.60	.60	.55	.67	.35	.40

a PWA. *b* 7 hr. day. *c* 6 hr. day. *d* 35 hr. wk. *e* 30 hr. wk. *f* Working under "stop-gap" agreement.



ENR Skilled Average: (Bricklayers, Carpenters, Iron workers) $1.435
ENR Common Average: $0.680

Why be Maintenance-Poor?



Guinda Avenue near Lincoln Avenue, Palo Alto, California. Concrete paved in 1928.

look at PALO ALTO'S low maintenance costs for CONCRETE

TYPE A	$16.85
TYPE B	6.30
CONCRETE . .	1.78

THESE figures represent *average surface maintenance costs* per 1000 sq. yd. per year. They are taken from Palo Alto's annual report on street maintenance and cover the past 24 years. Average age of concrete, 13 years. No wonder this progressive city now has about 3½ times as much concrete as all other pavements combined.

To concrete's admitted long life and low maintenance, add these other demonstrated advantages: concrete is safe—skid-resistant in wet weather or dry; smooth riding—free from ruts and chuckholes; clean and good looking.

What's more, concrete usually costs *less to build* than other pavements of equal load-carrying capacity—and it *stays built* for long periods without costly resurfacing and reconstruction.

PORTLAND CEMENT ASSOCIATION
Dept. A3a-17
33 W. Grand Ave., Chicago, Ill.

A National Organization to Improve and Extend the Uses of Concrete

The More Concrete Streets the Less Maintenance Expense

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

WATER LINE, MAINE

OWNER: Portland Water District; F. J. Reny, treasurer and general manager; Harry V. Fuller, engineer.

PROJECT: Construction of 7 mi. of 48-in. supply main and 4,100 ft. of 30-in. supply main in Portland and Gorham, Maine. Stipulated contract time is 325 calendar days. This entails winter work.

BIDS: Three bids were opened Oct. 20, 1938, ranging from the contract low at $570,310 to $636,408.

LOW BIDDERS:

1. Lock Joint Pipe Co., Ampere, N. J. (contract) $570,310
2. Price Bros. Co., Dayton, O. 625,175
3. Raymond Concrete Pile Co., New York, N. Y. 636,408

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 48-in. pipe	38,000 l. f.	$13.20	$14.48	$14.80
2. 30-in. pipe	4,100 l. f.	9.35	10.35	10.05
3. Ledge excav.	8,000 c. y.	3.75	4.00	4.05
4. Ledge excav.	100 c. y.	3.75	5.00	4.05

INTAKE TUNNEL, WASHINGTON

OWNER: City of Bellingham, Wash.; E. W. Gooch, city engineer, Baar & Cunningham, consulting engineers.

PROJECT: Construction of Lake Whatcom intake tunnel, 7,560 ft. long. Inside dimensions are 6½ ft. by 6½ ft. Stipulated contract time is one year. Transportation by highway is available. Small size of tunnel makes hand labor necessary.

BIDS: Nine bids were received January 30, 1939, ranging from the contract low of $325,380 to $585,838. Minimum labor rates are as follows: skilled, $1.40 per hr.; semi-skilled, $1.25 per hr.; common, 90c. per hr.

LOW BIDDERS:

1. B. H. Sheldon, Spokane (contract) $325,380
2. C. V. Wilder, Bellingham 359,525
3. Croy-Lich, Bellingham 362,376

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Clearing	2 acres	$100.00	$300.00	$200.00
2. Shaft excav.	350 c. y.	6.00	8.00	8.00
3. Timbering for shafts	20 M. b. m.	50.00	50.00	50.00
4. Portal trench excav.	2,200 c. y.	1.00	1.25	3.00
5. Portal trench timbering.	23 M. b. m.	50.00	50.00	40.00
6. Drainage trench excav. bkfl.	500 c. y.	8.00	5.00	2.00
7. 18-in. sewer pipe drain.	360 l. f.	2.25	2.00	2.35
8. Lumber in bridge	4 M. b. m.	50.00	50.00	50.00
9. Tunnel — sect. A	1,400 l. f.	21.00	25.00	20.00
10. Temp. timbering sect. A.	15 M. b. m.	50.00	50.00	60.00
11. Tunnel sect. B	6,160 l. f.	16.00	25.00	18.00
12. Steel sets — sect. B	216,000 lb.	.08	.10	.10
13. Lagging, etc.— sect. B.	245 M. b. m.	50.00	50.00	60.00
14. 6-in. drain	1,800 l. f.	.75	.65	1.10
15. 12 in. drain	1,900 l. f.	1.25	1.00	2.00
16. 15-in. drain	1,900 l. f.	1.75	1.50	3.50
17. 18-in. drain	2,000 l. f.	2.50	2.00	4.60
18. Overhaul	20,000 Sta. yd.	.002	.01	.02
19. Conc. tunnel lining	6,500 c. y.	20.00	15.00	20.00
20. Conc. shaft lining	50 c. y.	20.00	30.00	35.00
21. Copper water stops	3,000 l. f.	.50	.40	1.00
22. Drain or grout pipe	400 units	1.00	1.00	2.00
23. Pressure grouting	100 c. y.	35.00	40.00	40.00
24. Tunnel reinf. steel	75,000 lb.	.07	.10	.10
25. Shaft struct. reinf. steel	4,000 lb.	.07	.08	.10
26. Superstr.	L. S.	1,000.00	1,200.00	2,010.00
27. Ladder & manhole cover.	L. S.	100.00	75.00	150.00
28. Checkered plate, channel, etc.	L. S.	200.00	70.00	500.00
29. Setting gate	8,000 lb.	.02	.04	.05

WATER WORKS, COLORADO

OWNER: Board of Water Commissioners, City of Denver, Colo.; D. D. Gross, chief engineer, Board of Water Commissioners.

PROJECT: Construction of a pumping station and a 5 m.g. reservoir at 11th Ave. and Quebec St., to be known as Montclair Reservoir and Pumping Station. Reservoir is box-type, reinforced concrete; length is 276.5 ft., width 175 ft., height 15 ft. Pumping station is to be of brick, 53 ft. by 35 ft., having a height of 22 ft. Stipulated contract time is 240 calendar days. Transportation facilities via highway are available. Topography of the reservoir site is favorable for low excavation cost.

BIDS: Eleven bids were received November 30, 1938, ranging from the contract low of $92,535 to $112,894. Prevailing labor rates are as follows: skilled, $1.43 per hr.; semi-skilled, $1.00 per hr.; common, $0.714 per hr.

LOW BIDDERS:

1. J. T. McDowell, Denver (contract) $92,535
2. Dutton, Kendall & Hunt, Inc., Denver 92,845
3. Western Paving Construction Co., Denver 93,554

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excav.	4,300 c. y.	$0.60	$0.45	$0.33
2. Fill	14,500 c. y.	.45	.40	.23
3. Conc. Cl. A	3,480 c. y.	15.00	15.50	16.25
4. Conc. Cl. B	120 c. y.	12.00	15.50	15.50
5. Reinf.	380,000 lb.	.043	.045	.0475
6. Pipe fittings	L. S.	1,160.00	1,200.00	900.00
7. Misc.	L. S.	790.00	400.00	700.00
8. Pumphouse, etc.	L. S.	11,500.00	10,610.00	10,540.00

SEWAGE WORKS, MINN.

OWNER: City of Thief River Falls, Minn.; Lium & Burdick, Grand Fords, N. D., consulting engineers.

PROJECT: Construction of a sewage disposal plant and appurtenances for the city of Thief River Falls. Stipulated contract time is 230 calendar days. Transportation by rail, highway and water is available.

BIDS: Five bids were received Dec. 16, 1938, ranging from the contract low of $118,750 to $138,274. Minimum labor rates are as follows: skilled, $1.00 per hr.; semi-skilled, 70c. per hr.; common, 40c. per hr.

LOW BIDDERS:

1. Minneapolis Bridge Co., Minneapolis (contract) $118,750
2. Meinecke-Johnson Co., Fargo, N. D. 119,985
3. Northern Construction Co., Grand Forks N. D. 124,768

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 21-in. V.C. pipe	93 l. f.	$2.70	$3.60	$3.85
2. Lift station	L. S.	5,000.00	4,122.00	6,160.00
3. Lift station pump units	3 ea.	500.00	712.00	633.00
4. Comminutor	L. S.	1,500.00	1,496.00	1,541.00
5. Force main 12-in. C.I.	3,800 l. f.	3.50	3.58	3.25
6. Transite pipe	3,800 l. f.	3.50	3.50	3.15
7. Disposal plant	L. S.	66,000.00	64,668.00	65,725.00
8. Clarifier equip. No. 1	L. S.	2,600.00	3,018.00	2,650.00
9. Clarifier equip. No. 2	L. S.	2,500.00	2,827.00	2,400.00
10. Sludge pump	L. S.	600.00	620.00	693.00
11. Sludge digester equip.	L. S.	3,400.00	3,752.00	4,340.00
12. Sludge digester equip.	L. S.	3,100.00	3,390.00	4,125.00
13. Filter rock	3,320 c. y.	4.70	5.12	5.75
14. Chlorinator	L. S.	1,600.00	1,290.00	1,790.00
15. Dosing equip.	L. S.	2,200.00	2,025.00	2,350.00
16. C.I. water service	250 l. f.	1.20	1.076	1.25
17. Water system	L. S.	250.00	523.00	450.00
18. Outfall sewer (clay)	650 l. f.	3.30	3.50	4.00
19. Outfall sewer (conc.)	650 l. f.	3.15	3.35	4.10